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CONTENTS.

EDITORIAL:
- Electric Motors in Steel Works 513
- Flatirons and the Maximum Demand 514
- Electricity in a Retort House 514
- Electricity in the Locomotive Round House 514
- Electrical Conveniences and the Automobile 515
- Stage Realism 515

A Review of the Waterpowers of Alabama, Chiefly Undeveloped, by S. M. Ball 516
To Lengthen New York Subway Stations 519
Electricity at the Alaska-Yukon-Pacific Exposition 519
Patent Observations 520
Electrical Exports for January 520
Horizontal Gas Engines 520
The 235th Meeting of the American Institute of Electrical Engineers. 521
Ithaca Section, American Institute of Electrical Engineers 521
The Anniversary Dinner of the American Institute of Electrical Engineers 521
National Electric Light Association Convention 522
New York State Public Service Law Upheld 522
Last McAdoo Tunnel Bored 522
Annual Convention of the American Illuminating Electrical Engineers. 522
Iowa Independent Telephone Association 523
Assistant Electrical Engineer 523
Union Switch and Signal Company Directors 523
Alternating Currents and Their Applications, by Edson R. Wolcott ... 524
Omaha Electrical Exposition 525
Waterpower Wanted for Air-nitrate Factories 525
The Mackay Companies 525
Twin City Rapid Transit 525
Electrical Equipment of Peter Doelger's Brewery 526
A Well-lighted Store 528
London, Brighton and South Coast Single-phase Railway, by A. Webster 529
Work Started on Pennsylvania Electrification 530
QUESTIONS AND ANSWERS 531
The Part of Electricity in the Play "Via Wireless" 532
Merchants' Association of New York 533
The Chicago Electric Club 533
Single-phase Railways of Europe 534
Automatic Signal Recorder for Mines 534
Minneapolis Railway Bills 534
Loving Cup Presented to T. Commerford Martin 534
Sleet-storm Damage 536
Denver Tramway Reorganization 536
Electrical Committee, Underwriters' National Electrical Association .. 536
Illogical to Reduce Copper Production 536
Supply of Copper Increased 536
FINANCIAL REPORTS OF ELECTRICAL COMPANIES 536
REVIEWS OF CURRENT ENGINEERING AND SCIENTIFIC LITERATURE 538
Wireless 3,000 Miles 539

INDUSTRIAL SECTION:
- A New Automobile Ignition System 540
- A Motor Driven Three-Head Milling Machine 540
- Northern Flow-Controlled Electric Traveling Crane 541
- An Indicator Showing the Rate of Fuel Combustion 541
- Flame Arc Carbons 542
- A New Magneto-Telephone Set 543
- Developments in Mechanical Stoking 543
- Electrically-Driven Ore-Handling Bridges 544
- Controller for Battleship Motors 545
- A Purely Electrical Annunciator 545
- The Wasson Reel 545

Dehydrating of Transformer Oils 546
An "Exide Smoker" 546
Artistic Publicity from the General Electric Company 546
A Record Conduit Order 546
Rejuvenating Dry Cells 546
CURRENT ELECTRICAL NEWS 547
RECORD OF ELECTRICAL PATENTS 554

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ELECTRIC MOTORS IN STEEL WORKS.

For several years there has been going on a quiet but steady development in the application of the electric motor to the driving of auxiliary machinery in iron and steel works. The rapid strides being made in this line became evident about a year ago, when it was found desirable to organize the Association of Iron and Steel Electrical Engineers. The special problems to be met in this field are so numerous as to have afforded the new society an abundance of topics for discussion.

The electrical driving of rolling mills has, however, been regarded heretofore as an undertaking that the electric motor did not seem adapted for. There is now being completed at Gary, Indiana, a steel works in which there is an installation of electric motors not only on an unprecedented scale, but in which even the running of the rolls is directly intrusted to the largest induction motors built for industrial use. The presentation of the paper by B. R. Shover before the American Institute of Electrical Engineers on March 12, in which the electrical installation at Gary is described, therefore marks a noteworthy achievement in the industrial application of the electric motor for the most severe service in which mechanical power is utilized.

The Gary plant is unique in numerous ways. It is the largest steel works in the world. It contains the largest equipment of gas engines as yet installed. It makes use of the greatest installation of electric motors in any industrial plant. In all the details of handling the raw and finished products it has the most modern methods and machinery. It is a source of gratification, therefore, that the equipment of this machinery has been so carefully planned and its operation has been so successful that its influence on the design of other similar plants, which would have been great in any case, since it has been watched very closely, will be most beneficial for the further extended application of the electric motor. Outside of the steel industry its influence should also be widely felt, for, if the electric motor is adapted for the severe and violent load fluctuations and general hard knocks of rolling-mill service, there is certainly no more rigorous application for which it will not be found entirely adequate. Another interesting feature of the Gary installation is the success achieved in smoothing out the severe electrical disturbances that would be produced on the generating plant by the sudden load fluctuations of the rolling-mill motors. While the use of heavy flywheels on motors is not new, the conditions to be met were novel. All in all, the electrical industry has much to feel proud of in the Gary works of the Indiana Steel Company.

FLATIRONS AND THE MAXIMUM DEMAND.

In a large city in this country blessed with a central station of more than ordinary enterprise there have recently been put out between 10,000 and 15,000 flatirons on free trial. The ease with which the electric current is turned on, and the perfectly satisfactory work which the electrically heated flatiron is capable of, have made it very popular with the housewives, and they have become very enthusiastic over it. In fact, we believe they have been a little too enthusiastic, and have used it without proper discrimination.

In the city under discussion maximum-demand meters are used, with a primary charge and a graduated secondary charge. The flatirons take about as much current as five or six lamps and of course if the flatiron were put in use at the same time that nearly the maximum number of lamps were burning and kept in use for ten or fifteen minutes there was an increase in the apparent maximum demand, and consequently a higher rate upon which to base the primary charge. Not knowing that there would be a quick response on the part of the meter to the call for additional current and not appreciating that this is exactly what the meter has been installed for, there has been a little foolish use of the irons at the same time that the lamps were burning, and, while considerable revenue has been attracted to the coffers of the company, it has caused some dissatisfaction upon the part of the consumers.

It is not to be assumed that the dissatisfaction will last. It is only one more point upon which the consumer must be educated; but it must be borne in mind by the central-station companies that the consumers are in need of this education and that in disposing of current-consuming devices the instruction should go hand in hand with and form a part of the sale.

ELECTRICITY IN A RETORT HOUSE.

The good opinion in which some gas men hold electric motors is shown by the adoption of this sort of power in the new retort house and about the works of the gas company at Worcester, Mass.

In this new retort house, which is said to be one of the best in the country, the drawing and charging machines for the retorts, also the conveyors for coal and coke, are all operated with electric motors. The new coal shed near the retort house has a capacity for 20,000 tons of coal, and by means of the electrically driven conveyors one man does all the work of distributing the coal and also puts it on the hoppers that run to the charging machines.

Besides the machinery in the retort house and coal shed, the electric drive is also applied to a telpher system that runs about the works, so that there is no teaming or shoveling of coke. Pumps and other machinery connected with the manufacture of gas are also operated with electric motors, and the electric drive for the exhausters is under consideration. One advantage of the electric motors is the reduction of the number of steam pipes about the works that were formerly necessary to supply engines.

ELECTRICITY IN THE LOCOMOTIVE ROUND HOUSE.

Except in the lighting of the steam locomotive round house and the occasional equipment of a turntable with the motor drive, it is a question if the value of electricity in general engine terminal work is appreciated by central station and railroad officers. In many cases this class of power service is some of the most valuable business which can come to a central station, since it is liable to extend throughout the entire day and night, coming without regard to the power plant peak load. The combination of a round house with a small repair shop for minor locomotive adjustments, and the installation of a coal and ash-handling station on practically the same site, provide a field for electrical application which may well be cultivated. The operation of hoists and pumps by motors offers substantial operating economies to the railroad in comparison with the older methods, provided the whole plant is well designed and maintained. It is generally the case that the electrically operated turntable is the most economical of all means of reversing engines on tracks in confined spaces, and the flexibility of electric lighting, its adaptation to modifications of structure and ease of control, combine to maintain very satisfactory operating conditions in the relatively small number of engine terminals which have thus far been electrically equipped along proper technical lines. In passing, it might be said that this equipment involves only apparatus and material well known to the mechanical engineer, and embodying very simple means of control.

Outside the turntable work the requirements of coaling, ash handling, boiler washing, hoisting and transportation of materials, and the operation of repair-shop machine tools, ventilating fans and air compressors are the main electrical issues for central-station consideration. The fundamental idea must always be to reduce the cost of handling each locomotive to a minimum. Limited room and congestion of locomotives tend to raise the unit expense in every instance. In the coaling of locomotives local conditions will determine the form and type of structure that is best for the service, but generally this will require the use of gravity for feeding the tenders and some mechanical method of elevating the fuel to the proper height for rapid and positive discharge. In plants where a hoist is needed to raise the coal from the hopper where it is originally dumped by the fuel car for delivery into an overhead pocket, the motor drive affords the best control of the situation, with minimum attendance. In one plant thus equipped a 200-ton pocket can be filled in about two-and-one-half hours by one man, two buckets of one-ton capacity each being used, motor driven. Two men are needed at the car in addition, but the simplicity of the motor installation as a whole reduced the cost of handling coal to a little less than three cents per ton, between 300 and 400 tons of coal being chuted in twenty-four hours. In this house the cost of handling ashes and cinders was formerly about $7,200 a year. A motor-driven telpher system was installed, of about four tons capacity, so that the ashes could be removed from any portion of the cinder pit and loaded into cars. The cost of handling the cinders was almost entirely

saved by this means, as the work is easily done under the new conditions by any locomotive hostler who happens to be idle at the time.

Frequent washing of boilers and changing of the water is in some localities essential to the longest life of the tubes and the least time expended in the round house. Electrically-driven pumps for the washing, refilling and blow-off condensation piping and tanks offer the operating company excellent efficiency, minimum attendance, maximum ease of control, compactness and adjustment in such work. The absence of high-pressure steam leaks, small space requirements of the wiring and motor controllers, relatively small size of the motors in relation to steam cylinders for pump-driving, and the cessation of power bills when the pumps are not in operation makes such an installation especially useful in the confined quarters of a round house. In the house above referred to the handling of material is greatly facilitated between the round house and the machine shop by the installation of a two-ton electric telpher hoist having a speed of 200 feet per minute. To save labor an operating cage is provided near enough to the ground to permit any authorized attendant to step into it and operate the equipment. The latter arrangement reduces the cost of direct operation close to the cost of current and repairs.

For driving ventilating fans and the shop equipment associated with engine terminal practice the electric motor offers the same advantages that are found in other industrial installations. Anything which will increase the capacity of a machine tool engaged in repairing a locomotive or which will hasten the handling of the engine through the house and give it more time to earn money on the road is worth seeking. The operation of a motor hoist of the traveling type for transferring materials and machine parts between the round house and the shop is another step tending to increase the efficiency of the plant as a whole, as outlined above, and it may be an important factor in the rapid passing of an engine through the house.

Central-station men will do well to follow up the business possibilities in connection with round-house work. Even small towns are often important railroad centres, and a substantial relative increase in the station load and improvement of the load factor may be gained through an electrical installation which will save the railroad money while being profitable for the local electric supply organization.

ELECTRICAL CONVENIENCES AND THE AUTOMOBILE.

Successful automobiling for pleasure or commercial service has long been dependent upon electricity for ignition purposes, and within recent years electric lighting has been installed in many cars, either as the principal means of illumination or more generally as an auxiliary to oil and acetylene. It is only of late, however, that the advantages of electricity in completing the luxury of motor-car travel have been fully appreciated.

In some of the latest designs of limousine cars electric annunciators have been installed to facilitate the direction of the vehicles by their passengers. In front of the chauffeur is placed a small box with square glass panels in its top marked "Start;" "Fast;" "Club;" "Home;" "Stop;" "Slow;" "Left," and "Right." Inside the car a push-button signal installation is correspondingly marked, so that when any button is pressed a miniature lamp indicates the desires of the passenger to the chauffeur. To still further improve communication, however, telephone sets have been installed in some cars, forming, perhaps, the shortest lines of electric speech transmission in the world. The barrier of glass between the chauffeur and the passenger in a noisy street is just as real, however, as a distance of a few miles between one's home and office so far as easy communication is concerned.

Electric cigar lighters, small incandescent reflector lamps for illuminating gauges, clocks, speedometers and cyclometers, registration togs and general interiors of closed cars are constantly being applied in the most convenient machines. While these devices are relatively inexpensive, individually they swell the total of electrical applications, and are therefore a benefit to the owner of the automobile as well as to the progressive manufacturer and dealer.

STAGE REALISM.

Ever since the days of the old pantomimes, when stage carpenters and mechanics cudgeled their brains to devise mechanical effects which would carry out certain illusions, there has been an eagerness on the part of those interested in stage pictures to utilize electricity as an agent in producing realistic effects. The Germans are possibly entitled to the acknowledgment of leadership in taking advantage of the flexibility of electrical conductors, and the utility of strip and border lights, drop lights and projectors for supplementing the mechanical effects with such features as moving water, cyclones, waterfalls, breakers, snow scenes and other bits of stage realism.

Within the last few years, however, the alert stage manager in this country has gone far ahead of his German brethren, and the daring and ingenuity which have been exercised have produced some of the most remarkable stage pictures it is possible to conceive. Few people realize to what an extent electrical and mechanical auxiliaries are used in producing a stage picture, and of the tens of thousands of people who have been witnessing the production of "Via Wireless," which has been admirably staged by Frederic Thompson of New York, few have any idea of the vast amount of labor and material necessary to produce the remarkable foundry scene, and the more remarkable ship scene in which the wireless operator brings to a thrilling climax the part played in picking up a disabled steamer and rescuing those on board.

It is in the little touches here and there which the use of electricity makes possible of reproducing with the utmost fidelity that makes this piece of stage realism so exceptional. In fact, so cleverly are the various features arranged that night after night the audience has applauded the stage picture before the principals have even made their appearance on the scene.

A REVIEW OF THE WATERPOWERS OF ALABAMA, CHIEFLY UNDEVELOPED.

BY S. MAYS BALL.

The five principal drainage basins of the state of Alabama are as follows:

The Apalachicola basin, draining to the Chattahoochee and Apalachicola rivers and entering the Gulf of Mexico at Apalachicola, Fla.

The Choctawhatchee basin, draining to the Gulf of Mexico through Choctawhatchee Bay.

The Pensacola basin, draining to Pensacola Bay and Perdido Bay, near Pensacola, Fla.

The Mobile basin, including the waters of Tallapoosa, Coosa, Cahaba, Alabama, Black Warrior and Tombigbee rivers and draining into the Gulf of Mexico at Mobile, Ala.

The Tennessee basin, draining into Tennessee River and thence through the Mississippi River to the Gulf of Mexico at New Orleans.

The waterpowers of the state of Alabama are mainly in the Mobile and Tennessee basins, which practically cover the entire state, except a small area in the southeast corner.

Geologically the state of Alabama is practically divided into three areas, which differ very greatly from one another in the hardness and durability of their rocks and show a corresponding difference in the profiles of their streams: First, the crystalline area underlain by igneous and metamorphic rocks; second, the paleozoic area of hard sedimentary rocks, sandstone, limestone and shale; third, the coastal plain formed by the mesozoic and later sediments, chiefly soft limestone and unconsolidated sands and clays.

The crystalline area is a plateau ranging in elevations from 500 to 2,000 feet above the sea level. The rivers flow over bedrock in a succession of shoals and eddies between high hills and present conditions most favorable to the development of waterpowers with high speed.

Tallapoosa River and its tributaries drain the larger part of this area. On Tallapoosa River there is a fall of sixty-four feet utilized as one power at Tallassee and also a forty-foot dam about three miles above Tallassee. Similar developments are contemplated at several points above. The falls on Coosa River from Marble Valley to Wetumpka, 235 feet in forty-five miles, and on numerous eastern tributaries of the Coosa are in the crystalline area, as also the western tributaries of the Chattahoochee River between West Point and Columbus, Ga.

The paleozoic area includes the greater portion of northern Alabama, being bounded on the southeast by the crystalline area and on the southwest by the cretaceous and later formations of the coastal plain. The line of division between the paleozoic area and the coastal plain begins near Strasburg, in Chilton County, and runs northwesterly through Centerville, Tuscaloosa and Tuscumbia to a point on the Tennessee River near Waterloo. The paleozoic area is somewhat higher than the coastal plain and slightly lower than the crystalline area. Its rivers have considerable fall, as shown by the following figures:

Coosa River from Greensport to Marble Valley falls 132 feet in ninety-seven miles.

Cahaba River above Centerville has a fall of 120 feet in twenty-one miles.

Black Warrior River above Tuscaloosa has a fall of 100 feet in thirty miles.

Tennessee River above Waterloo has a fall of 150 feet in forty-one miles, eighty-five feet of which is in a distance of only fourteen miles.

There are many important creeks and many large limestone springs in this region on which no measurements have yet been made. This area is rich in coal and iron, the most productive mines being in the drainage basins of Cahaba and Black Warrior rivers.

The coastal plain is a large area in southern and western Alabama, covering about two-thirds of the state, and is underlain by cretaceous and younger formations. In the upper portion of this area the streams are not sluggish. Alabama River is navigable in the whole region, but the Cahaba River falls 120 feet in a distance of eighty-seven miles from Centerville to the mouth of the river, and the Black Warrior River falls fifty-nine feet in 132 miles from Tuscaloosa down to Demopolis.

There are many streams in this area that have a constant water supply and sufficient fall for the development of good waterpowers. One of these is the Pea River, in the southeastern part of the state, where a dam has been constructed to give a power head of twenty feet. No hydrographic work of any great extent has yet been done on the streams of southern Alabama that rise in the coastal plain.

It must be understood that from West Point, Ga., southward the boundary between Georgia and Alabama is on the west bank of the Chattahoochee River, along the line where ordinary vegetation ceases to grow. This leaves all of the waterpower of the main stream in Georgia. There are many creeks flowing into this river from Alabama, some of which have considerable fall, as they come from a high plateau. Holland Creek, opposite Columbus, Ga., furnishes the Columbus water supply by gravity, having a fall of 117 feet in less than four miles. No doubt, as the United States Geological Survey believes, many of the other creeks have as much fall as Holland Creek, but they have not been as yet measured, and reports on them are not available.

The Tallapoosa River rises in west-central Georgia and flows southwesterly into Alabama. Six miles above Montgomery it joins the Coosa to form the Alabama River. Its upper tributaries drain an area between the Chattahoochee and Coosa basins. At Tallassee, Ala., it crosses the southern fall line. The shoals at this place have a fall of sixty feet, forming an obstruction to navigation. The drainage area is largely wooded with cultivated fields at short intervals.

Above Milstead the river flows on granitic bedrock and has numerous bluffs along its banks, affording excellent sites for dams.

Two large developed waterpowers on the river, the Tallassee Falls plant and the Montgomery Power Company's plant, are near the lower end of the area surveyed. The Tallassee Falls dam and canal which are six miles above Milstead utilize a fall of sixty-four feet. Some time since this power was capable of furnishing 8,900 net horsepower without storage during low water. The Montgomery Power Company has a forty-foot dam nine-and-one-half miles above Milstead. This dam backs the water six-and-one-half miles up the river and forms an immense storage basin. The power from this plant is transmitted electrically a distance of about twenty-seven miles to Montgomery. With the river at the stage of lowest water observed at this plant, it will develop at the wheels 5,572 net horsepower from the run of the river without drawing on the storage. The equalizing storage of this dam will add fully twenty-five per cent to this power—at Tallassee also—for continuous running without materially lowering the head at either plant.

Arrangements were made for a large dam thirty-five or forty feet in height at or near Double Bridge Ferry, to back the water beyond Robinson's Ferry, a distance of about eight miles; this is an excellent site for a dam. The horsepower in proportion to head is the same as that availa-

ble at the Montgomery Power Company's dam.

From the mouth of Big Sandy Creek to a point one mile above Griffin Ferry, a distance of thirty-two miles, the fall of the Tallapoosa River is 176.5 feet. Nearly all of this fall can be utilized for power by development similar to those already made on this river. The questions of the best power sites and proper plan of development, height and location of dams, etc., can be determined, only, of course, by special investigation and surveys. B. M. Hall, of the United States Geological Survey, reported, however, that it would be safe to assume that a practical site for a dam up to forty feet high can be found in the vicinity of any location which might be selected, and the power obtainable can be estimated by multiplying the volume of water or its equivalent net horsepower per foot of fall by the proposed head to be developed.

The water supply or discharge of Tallapoosa River at different points may be closely approximated from records of the Milstead, Susanna and Sturdevant hydrographic stations, from records of the Alabama and United States Geological Surveys, also from those at the Dadeville and Alexander stations on the tributaries.

The best shoal on Big Sandy Creek, tributary of Tallapoosa River, is the Sanford and Black Shoal near Dadeville which has a fall of 85.8 feet in a distance of 5.2 miles. With a dam fifty-four feet high and a canal 1,370 feet long it is estimated by the United States Geological Survey that a practical working head of eighty feet can be developed having one foot extra for grade of canal and four feet extra for storage at top of dam. The city of Dadeville developed the most precipitous part of this shoal (December, 1903), known as the Sanford Shoal, and obtained a power head of forty feet by a dam four-and-one-half feet high and a canal about 600 feet long. The power is transmitted about two miles to Dadeville for electric lights and other purposes.

As to the tributaries of the Tallapoosa River above Milstead, no state or federal government surveys have ever been made to determine their profiles, and it is therefore impossible to make a detailed statement of the available waterpowers; they are all in the crystalline area and have fine shoals along their courses. The discharges can be obtained at different points, and this flow multiplied by the total practical fall in feet that can be brought to a waterwheel on a given stream at a given point and divided by eleven, will give the net available horsepower at that given point during the low season. As a general rule, the discharge and drainage area at a given point can be computed from the discharge and drainage area at other points on the same stream if that drainage area is known.

The Coosa River is formed by the junction of the Etowah and Oostanaula rivers at Rome, Ga. The drainage area is 4,006 square miles. Both of the tributary rivers rise in the northern part of Georgia and flow for the most part through a hilly, broken country, well wooded, about one-fourth of the land being under cultivation. Coosa River flows in a southwesterly direction into Alabama and joins the Tallapoosa six miles above Montgomery to form the Alabama River.

From Rome down to Greensport, Ala., a distance of about 180 miles by river, navigation has been carried on for many years. The total fall in this section is only about fifty-five feet and is so well distributed that it has not been necessary to construct locks at any point, though improvements have been made by the United States government in the way of deepening channels, blasting out reefs, building wing dams, etc. It is, therefore, safe to consider this part of the Coosa river as having no waterpower value.

Below Greensport, Ala., the river has a large amount of fall, and although it is proposed to make the whole distance navigable by the construction of locks there are many fine waterpowers which can be developed in connection with the river improvements without interfering in any way with navigation.

A complete survey has been made of this portion of the river by the United States engineers and a system of locks planned. The total distance from Greensport to Wetumpka, Ala., is 142 miles and the number of locks proposed is thirty-one, varying in lift from 5.83 feet to fifteen feet; work now is being done by the federal government on these locks as fast as Congress appropriates the money.

At most of these locks and proposed locks, reservations have been made by the original owners of the river front of the privilege of utilizing for power the water not needed for lockage. By constructing a plant at the opposite end of the government dam from the lock, the United States Geological Survey is of the firm opinion that the surplus water can be used without interfering with navigation.

Of the thirty-one proposed locks on Coosa River, between Greensport and Wetumpka, Ala., the latest reports by the federal government show an estimated total net horsepower in 1897 of 49,467 and in 1900 of 100,798 horsepower.

The elevations of the water surface of Coosa River between Wetumpka and Greensport show at Wetumpka Bridge 154.37 feet above the sea level; at Lock No. 1, 517.89 feet above sea level; there is a gradual fall all the way, as determined in 1889 by Charles Firth, assistant engineer under Captain Philip M. Price, U. S. A.

Choccolocco Creek, a Coosa River tributary, rises in Calhoun and Cleburne counties in a mountainous crystalline region and flows in a southwesterly course past Anniston, Oxford and Jenifer and enters Coosa River near Eureka. The Choccolocco is a very rapid stream and drains a mountainous, well-wooded country. At the Jenifer station the drainage area is 280 square miles.

There are many tributaries of the Coosa River above Wetumpka, and upon them, all rapid flowing creeks, there are many important waterpowers, very few of which have even been surveyed. Talladega Creek in the vicinity of Taylors Mill has a fall of seventy-three feet in one mile. During the low water of 1900 and 1901 this fall would have produced 438 net horsepower without storage. This seventy-three feet is probably the most precipitous shoal on the large creek, but above it for four or five miles the creek has a number of rapids and shoals that will admit of good development. The headwaters of this stream in the neighborhood of the pyrites mines in Clay County have high falls on them.

Choccolocco Creek is a very large and constant stream and has on it many rapids where good power could be developed by dams. During a season such as the low water of 1900 or 1901 a ten-foot dam near Jenifer would develop eighty-six net horsepower. A ten-foot dam at any point near the mouth of the creek would develop 140 net horsepower during the low seasons.

Wills Creek at the old Wesson mill, two miles east of Attalla, offers a good site for a twenty-five foot dam. The flow at this point, during one dry season, was 107 second-feet, which with a fall of twenty-five feet will give 242 net horsepower. The fall on the other tributaries has not been ascertained.

The Cahaba River rises near Birmingham, Ala., and flowing in a southerly direction enters Alabama River just below Selma, Ala.

The Corps of Engineers, U. S. A.,

made a survey of this stream beginning at the southwestern boundary of Shelby County and running down the river 110 miles to its mouth, in which distance there is a fall of 256 feet.

Following is a numbered list of powers on Cahaba River that could be developed:

Power No. 1. From the head of Halfmile Rapids at Station No. 108 there is a succession of shoals known as the Halfmile, Long Island, Fishtrap, Ford, Reach and Dry Creek shoals, in which the aggregate fall is thirty feet in two-and-one-fourth miles. There is also a fall of about four feet from the Shelby County line down to the head of Halfmile Shoal, making a total fall of thirty-four feet in four miles. This can be developed by either building a dam thirty-four feet high at the mouth of Dry Creek and backing the water to Shelby County line or by building a low dam near the head of the shoals and a canal from it to a point opposite the mouth of Dry Creek. Such a development would give about 500 net horsepower with an eighty per cent turbine at ordinary low season. This power would be near Blocton, Ala.

Power No. 2. By building a dam fifteen feet high at the head of Baily Reach Rapids near Station No. 101 and near the mouth of Ugly Creek to back the water to the mouth of Persimmon Creek Branch near Station No. 104 and constructing from this point a canal along the river bank about four miles long to a point opposite Station No. 97 at the mouth of Little Cahaba River, a practical head of fifty-four feet can be developed. This allows eight feet for storage and grade, as the total fall is sixty-two feet. A fifty-four-foot fall would produce about 800 net horsepower. The same power can be developed by building a high dam lower down the river and having the canal shorter; or the power can be divided into two separate powers. This power site is between River Bend and Cadle, in Bibb County.

Power No. 3. From the mouth of Little Cahaba down to Station No. 88½ at the top of Centerville Shoals, there is a fall of ten feet in eight-and-one-half miles and from the top down to the foot of Centerville Shoals at Centerville there is a fall of 13.6 feet in about one-and-three-fourths miles. This power could be developed by a ten-foot dam at the top of Centerville Shoals and a canal from there to Centerville one-and-one-half miles long. Allowing 2.6 feet for storage and canal grade, a head of twenty-one feet can be obtained, which would give 650 net horsepower. Probably a much better method of development would be to erect a dam at Centerville 23.6 feet high to back the water to the mouth of the Little Cahaba River. This would produce 732 net horsepower with storage. The incidental storage of such a dam would naturally add largely to the amount and efficiency of the power. A plant running only twelve hours a day, and storing the water at night, would utilize 1,440 net horsepower. This power site is at Centerville, on the Mobile & Ohio Railroad.

Power No. 4. A sixteen-foot dam could be built at Shoal No. 9, Station No. 69½, in Perry County, just below the Bibb County line. This dam would back the water for twelve miles to Shoal No. 2, four-and-one-half miles below Centerville. A sixteen-foot head will produce 670 horsepower without storage, or 1,340 by storing water at night and running only twelve hours daily. This dam site is about seventeen miles below Centerville by river.

Power No. 5. A fifteen-foot dam at Blocks Cut-off, near Station No. 55, will back the water ten miles to the mouth of Taylors Creek, and will produce 750 continuous, or 1,500 twelve-hour horsepower.

Power No. 6. At Shoal No. 24, Station No. 50, there is a fall of nine feet in less than a half-mile. A fourteen-foot dam at the foot of this shoal, or a five-foot dam at its head and a short canal would develop a head of fourteen feet and realize 720 continuous, or 1,400 twelve-hour horsepower. This site is just above Burras Island, eight or ten miles northeast of Marion, Ala.

Power No. 7. From Burras Island to Fikes Ferry there is a fall of twenty-two feet in a distance of seven miles, twenty feet of which could probably be utilized by a dam at Fikes Ferry, producing 1,100 continuous, or 2,200 twelve-hour horsepower. Fikes Ferry is near Marion, Ala.

In making the above statement of powers that could be developed, the United States Geological Survey has assumed that there are suitable banks for dam sites. The system proposed or some other system approximating to it would not interfere with navigation improvements, as docks could be constructed at the dams.

The Black Warrior River is formed by the junction of the Mulberry and Sipsey forks of Black Warrior at old Warriortown, in Walker County, and runs in a southwesterly direction past Tuscaloosa to Demopolis, Ala., at which point it enters Tombigbee River. Above Tuscaloosa, it is known as the Black Warrior River and below Tuscaloosa as the Warrior River.

A great deal of work is being done by the federal government on this river in order to make it navigable as an outlet to important coal fields above. In the ninety-two miles from old Warriortown to Tuscaloosa there is a fall of 158 feet.

The locks and proposed locks on this section of the river begin with No. 1 at Tuscaloosa and are numbered up the river. Locks 1, 2, 3 and 4 are about completed entirely and others are projected.

These are the following powers estimated on Black Warrior River when all thirteen of the locks are completed: Six hundred and fifty horsepower at bottom of the University Shoal at Tuscaloosa; 560 horsepower on University Shoal, Tuscaloosa, and another power on same location at Lock No. 4 of 690 horsepower; 777 horsepower near mouth of Yellow Creek at Lock No. 5; 540 horsepower at Lock No. 6, foot of Fair Shoals; at Lock No. 7 840 horsepower at foot of Squaw Shoals; at Lock No. 8 660 horsepower on Squaw Shoals; at Lock No. 9 on Squaw Shoals 840 horsepower; at Lock No. 10 700 horsepower below Black Rock; at Lock No. 11 700 horsepower mouth of Little Warrior River or Locust Fork; at Lock No. 12 476 horsepower, and Lock No. 13 364 horsepower.

The best power on this river is at Squaw Shoals, twenty-six miles above Tuscaloosa, covered by Locks 7, 8 and 9, each having a lift of fourteen feet, making a total fall on Squaw Shoals of forty-two feet. This can be developed to best advantage by constructing a canal from the top of the proposed dam at Lock No. 9, along the river bank two miles in length to a point opposite the foot of Squaw Shoals below Lock No. 7. This canal taking the water not needed for lockage, and allowing two feet for grade and storage, will utilize a net head of forty feet and produce 2,400 net horsepower continuously, or 4,800 net horsepower for a twelve-hour run per day, storing the water above Lock No. 9.

These estimates are made for low seasons during ordinary years. The United States Geological Survey reports that it believes that the proposed development at Squaw Shoals could be made at a very moderate cost and that such an investment would pay handsomely.

At Clear Creek Falls, a tributary of Black Warrior River, in Winston County, within a distance of half a mile there is a fall of over 100 feet, distributed as follows: Rapids above upper falls in 100 yards, six feet; upper falls about forty-five feet; still pool for 275 yards, lower falls, twenty-seven feet, and rapids, below lower falls, thirty feet.

There are several large creeks in Marion and Lamar counties that flow into the state of Mississippi and enter Tombigbee River near Columbus, Miss. One of these, Buttahatchee River, in Marion County, has numerous rapids, especially near the crossing of the military road.

Luxapalilla Creek, another Tombigbee River tributary, has two prongs that are both good power streams. They come together before the creek enters Mississippi, making Big Luxapalilla Creek, which enters the Tombigbee at Columbus, Miss.

The Tennessee River, after passing

Chattanooga, enters Alabama. It then makes a bend to the west and later to the north, returning to Tennessee. Flowing through that state and Kentucky it empties into the Ohio, fifty miles above Cairo.

In the Tennessee River, vicinity of Florence, Ala., are several shoals capable of power development. The shoals are a succession of cascades amid many islands in a river bed varying in width from one-half to three miles. The numerous channels thus formed are very irregular in fall and direction. The difference between high and low water is only five or six feet, corresponding to a rise of fifty feet at Chattanooga. Beginning at Browns Ferry, twelve miles below Decatur, Ala., the Tennessee River has the following falls:

From Browns Ferry to the mouth of Elk River the fall is twenty-six feet in eleven miles. This is known as Elk River Shoals; its most precipitous part is at the lower end, where there is a fall of 16.5 feet in about four miles.

From the mouth of Elk River to the head of Mussel Shoals, a distance of five miles, there is a fall of only two feet.

From the head of Mussel Shoals to Bainbridge the fall is eighty-five feet in seventeen miles, and is known as Mussel Shoals.

From Bainbridge to Florence the fall is twenty-three feet in seven miles, and is known as Little Mussel Shoals.

From Florence to the head of Colbert Shoals the fall is three feet in eleven miles.

From the head of Colbert Shoals to Waterloo the fall is twenty-one feet in six miles.

The total fall from Browns Ferry to Waterloo is, therefore, 160 feet in a distance of fifty-seven miles. Sixteen miles of this distance, however, has a fall of only five feet, leaving a fall of 155 feet in the forty-one miles that cover the four shoals mentioned. The shoals are really more precipitous than the foregoing figures would indicate. For instance, 84.6 feet of the fall at Mussel Shoals is in a distance of only fourteen miles.

Assuming, therefore, that the tributaries entering the Tennessee River below Chattanooga will safely supply all the water needed for lockage, the discharge at Chattanooga can be used in estimating the waterpower of these shoals which are about 200 miles below Chattanooga by river, and of which the drainage area is more than 7,000 square miles greater than at Chattanooga.

Estimated minimum of net horsepower of Tennessee River in Alabama on turbines realizing eighty per cent of the theoretical power:

Elk River Shoals, twenty-six feet fall; minimum net power in driest year, 15,600; minimum net power in average years, 30,550.

Mussel Shoals, eighty-five feet fall; minimum net power in driest years, 51,000; minimum net power in average years, 99,875.

Little Mussel Shoals, twenty-three feet fall; minimum net power in driest years, 13,800; minimum net power in average years, 27,025.

Colbert Shoals, twenty-one feet fall; minimum net power in driest years, 12,600; minimum net power in average years, 24,675.

Total fall, 155 feet; total minimum power in driest years, 93,000; minimum net power in average years, 182,125.

This table assumes that the total fall could in each case be utilized. While this assumption is not correct, says the United States Geological Survey, it stands as an offset to the assumption that the water supply available will be as low as the minimum discharge at Chattanooga, 200 miles above. The drainage area above Chattanooga is 21,418 square miles, while the drainage area above the shoals discussed is about 29,000 square miles. It may, therefore, be safely assumed that the actual power available for development at these shoals is greater than shown above.

Paint Rock Creek, Elk River, Shoal Creek, Flint Creek, Nance Creek, Town Creek and Big Bear Creek are all large streams, tributaries of the Tennessee River, and most of them have fine undeveloped waterpowers. However, no surveys have been made of these streams as yet.

The writer believes that this review, based on the collected reports made by the United States Geological Survey and the Geological Survey of Alabama, Dr. Eugene A. Smith, State Geologist, covers as full a statement of the surveyed waterpowers in Alabama as can be prepared at this time. Acknowledgments are made to Dr. Smith and the United States Geological Survey for permission to use much valuable data herein.

To Lengthen New York Subway Stations.

Chairman Willcox, on behalf of the New York Public Service Commission, has written President Shonts, of the Interborough Rapid Transit Company, that the commission will immediately order its chief engineer to prepare necessary plans for lengthening the New York city subway stations, which is expected to increase the capacity of the subway twenty-five per cent. It is thought the work will be completed in ten months at a cost of $1,000,000.

Electricity at the Alaska-Yukon-Pacific Exposition.

Electricity, both in decorative effects and in the character of the exhibits, will be a feature of the Alaska-Yukon-Pacific Exposition, which opens in Seattle on June 1.

Snoqualmie Falls will provide all the power that the city has any present use for. Of the power brought down from the Snoqualmie, 10,000 kilowatts will be delivered at the substation at the fair grounds. Of this the exposition will take 2,500 kilowatts. The United States Government, the concessions on the amusement way, the "Pay Streak," and several other demands of size will be supplied from the remainder. The substation will also take care of the overload at the terminals of the street-railway system.

Current will be delivered at the substation at 13,200 volts, transformed to 2,300 volts, and distributed around the grounds at that voltage. In the buildings it will be changed to 117-234 volts on a three-wire system. Each building is equipped with a fireproof transformer room under the rules of the fire underwriters.

A two-phase, sixty-cycle light and power system has been put in with all wiring underground. No pole shows anywhere on the grounds, although a belt pole line encircles the ground.

All told, there will be 250,000 lamps used on the grounds. These will be four, eight, sixteen, twenty and thirty-two candlepower carbon-filament as well as various larger sizes of tungsten lamps. In the Fine Arts Building there has been installed a special arrangement of tungsten lamps.

The central feature of the exposition is a cascade, down which 40,000 gallons of water will plunge every minute over a series of dams. At the lip of each dam heavy hoods protect powerful lights behind glass of the primary colors. The shading is from the lighter tones in the centre to the darker tones on the outside, and at the preliminary trial of the arrangement a fine effect was produced.

Experiments in wireless telegraphy and telephony will be conducted throughout the exposition, and there will be a demonstration of the wireless projection of power.

There will be an exhibit in the Transportation Building of electrically-propelled automobiles, and on Lake Washington the electric motor boat will be a prominent feature of the motor-boat show.

Patent Observations.

TO THE EDITORS:

Our Government, as a whole, when viewed from a mechanical and engineering point of view, presents some striking defects in construction, with the consequent low percentage of efficiency in operation. My conception of government is the regulation of the rights of ownership (ownership including personal as well as property rights), for the purpose of promoting happiness and progress.

The inherent longing of the individual to acquire, to achieve, in the hope that it will bring that pleasant balanced state of mind we call happiness, is the prime mover of progress. Then, so far as the government encourages and protects the individual and logically regulates his rights, it makes for progress and happiness.

Apparently the designing engineers of the governmental machinery have little regard for economy of progressive power when history and observation show that many people, particularly inventors, spend a great part or all of their lives looking for an opportunity to be useful; while others who have the opportunity are not forced to use it.

While it is evident there are many poorly designed machines in our governmental machinery, I will only direct attention to those located nearest my corner of the shop.

The Patent Office report for 1908 shows: The receipts were $1,896,847.67. Expenditures were $1,172,303.42, giving a surplus of $724,544.25. Not a bad showing for a fostered branch of the government. This is what it *doesn't* cost to *give* protection (?) to inventors.

From experiences I have had in the office, it would seem, at least, this surplus could be advantageously applied to increasing salaries for the present number of employes or adding to their number, preferably the former, for this is a case where a few good trained men are better than many inefficient green ones. As it is now, the applicant or his attorney frequently finds it necessary to educate the examiner-in-charge in the most fundamental principles of patent law before allowable claims will be allowed. Not long ago, I received an office action rejecting one claim with the statement: "Applicant cannot be allowed to multiply *claims* by adding old elements to previous combinations." I asked for a review of that action, and criticized that statement by saying: "It is my impression that the addition or subtraction of one or more elements to or from a previous combination is just what constitutes invention and is the subject of patent." Of course, provided the new combination is useful. Two other claims were rejected on Smith *and* Jones. I have had claims rejected that way before, and it took me six months to convince the examiner-in-charge that the fact that my claims *each alone* involved structures from both patents, cited, was just what entitled me to a patent.

It seems rather remarkable that the granting of protection to inventors should be made a paying proposition, when the results of their labors add more to the assets and standing of the nation than any other line of endeavor; agriculture, mining or war not excepted; because the inventor precedes material achievement in all lines.

We spend large sums each year to tell the farmer *maybe* it will be raining or clear tomorrow. Many millions are now being expended to reclaim arid lands in the West, this land having been acquired and made valuable by the expenditure of government money. Individuals may acquire *perpetual* title by the payment of minor fees, a manifestation of intention to use the land. But when a person makes an invention, which is the nearest possible to making something out of nothing, and is the result of individual effort, a shaky title and rights of ownership are granted for only seventeen years. This looks like a blunder in governmental construction. It is illogical, inconsistent, and unjust; the ill effects are becoming more and more apparent. More substantial encouragement and protection should be extended to inventors. At least five or ten millions could be advantageously expended each year in experimental shops and laboratories.

There is not as much reason for perpetual land titles as there is for perpetual patents. I think land titles should be half as long as patents, say, twenty and forty years, respectively.

OLIN S. PROCTOR.

New York, March 6.

Electrical Exports for January.

During the month of January, 1909, the electrical exports from the United States fell off from the improved showing of the preceding month and also somewhat from the total of a year ago. The falling off from the month of December, 1908, was about evenly divided between electrical machinery and electrical appliances. The figures given in the following compilation are taken from the official statistics of record.

The total electrical exports for January, 1909, were valued at $953,160, compared with $1,199,170 for December, 1908, $759,503 for November, 1908, and $999,606 for January, 1908. As classified into appliances and machinery, the totals were: Electrical appliances—January, 1909, $500,309; January, 1908, $454,748; December, 1908, $611,611. Electrical machinery—January, 1909, $452,851; January, 1908, $544,858; December, 1908, $587,559.

The principal countries to which electrical exports were sent during January, 1909, were as follows:

Electrical appliances—British North America, $98,441; Brazil, $85,323; Central American states and British Honduras, $49,997; Mexico, $42,489; United Kingdom, $41,953; Cuba, $36,508; other South America, $29,072; Japan, $20,643; Argentina, $17,583; Philippine Islands, $12,238; France, $11,881; Germany, $10,113.

Electrical machinery—Japan, $113,784; Mexico, $49,235; United Kingdom, $36,054; British North America, $34,394; British Australasia, $23,421; Brazil, $20,067; British Africa, $18,729; Central American states and British Honduras, $17,682; Argentina, $12,142; British East Indies, $10,977; other South America, $7,155; Cuba, $6,032; France, $5,957.

Horizontal Gas Engines.

The Westinghouse Machine Company, East Pittsburg, Pa., records contracts for nine horizontal engines during the past two months, which exemplifies the confidence users have in this type of power equipment. The most recent contract covers two 750-horsepower tandem units for the Iola Portland Cement Company, Iola, Kan. They will be installed in an extension to the large cement mill at Iola. It is noteworthy that the Iola company has had nearly ten years' experience with gas engines in its cement mills and the operating equipment comprises fourteen engines of vertical and horizontal type, all of Westinghouse construction, some of which have operated for the entire period. The horizontals are of the same type as the new engines and have established for themselves a record of over a month's continuous operation without closing the throttle, as have also the vertical engines. The new engines will be direct-connected to the cement mills as in the previous equipment.

The 235th Meeting of the American Institute of Electrical Engineers.

ELECTRICAL APPLICATIONS AT THE GARY PLANT OF THE INDIANA STEEL COMPANY.

The 235th meeting of the American Institute of Electrical Engineers was held in the Engineering Societies' Building, Friday evening, March 12. Secretary Pope announced that at the meeting of the board of directors held during the afternoon there were 113 associates elected and the following associates transferred to the grade of member: Henry Waterman Peck, Rochester, N. Y.; George Edwin Claflin, Boston, Mass.; Bradley T. McCormick, Montreal, Quebec; Paul Spencer, Philadelphia, Pa.; Robert Halsey Henderson, Bloomfield, N. J.

Announcement was made of the following directors' nominees:

For president, L. B. Stillwell, New York city; for vice-presidents, J. J. Carty, New York city, Paul M. Lincoln, Pittsburg, Paul Spencer, Philadelphia; for managers, A. W. Beresford, Milwaukee, W. S. Murray, New Haven, H. H. Norris, Ithaca, S. D. Sprong, New York; for treasurer, George A. Hamilton, New York city; for secretary, Ralph W. Pope, New York city.

The paper of the evening was entitled "The Industrial Application of the Electric Motor as Illustrated in the Gary Plant of the Indiana Steel Company." This paper was presented by the author, B. R. Shover, electrical engineer of the Indiana Steel Company.

The discussion was opened by B. A. Behrend, who stated that as the designer of the seventeen generators constituting the 40,000 kilowatts installed at the Gary plant, he had been particularly interested in the paper. There are fundamental conditions to be met in power plants utilizing alternating generators for direct connection to gas engines. This is a problem of the greatest importance in steel mills. The choice of the right flywheel effect is intimately bound up with this question and the necessary moment of inertia of the flywheel can be determined intelligently only by the designer of the alternating-current generators. Electric gas-engine-driven units must operate successfully in parallel if the gas engine is to be an important factor in steel mills. This problem resolves itself into an investigation of the periodic disturbing forces produced by the engine and the natural frequency of the generating unit. As the gas engines at Gary are four-cycle, double-acting, cross-tandem engines, there are introduced two periodic disturbing forces, due to inequality in the force of explosions, adjustment of valve gear, leakages, etc., whose frequencies are one per revolution and one-half per revolution of the engine.

If any measure of success was to accompany the construction of the Gary plant, great forethought had to be exercised lest the successful parallel operation should be dependent upon a lucky guess upon the part of the gas-engine builder. Before calculating the moment of inertia of the units or the flywheel effect, extensive experiments were carried on to determine the natural frequency of oscillation of generators of similar design. These investigations made it possible to determine beforehand the natural frequencies at all excitations of the Gary generators.

The paper was also discussed at length by Gano S. Dunn, D. B. Rushmore, W. T. Dean, Brent Wiley and Robert Hull.

Ithaca Section, American Institute of Electrical Engineers.

The Cornell Branch of the American Institute of Electrical Engineers had its annual banquet March 5, in the Sibley College Club rooms, attended by about seventy-five members of the local branch. D. B. Rushmore, of Schenectady, N. Y., was the guest of honor, and Prof. E. L. Nichols officiated as toastmaster. After an enjoyable menu, a number of toasts were given. Professor Norris responded to the toast on "Speed Graphs" or "Acceleration on the Motor Curve," giving an interesting analogy between the speed control of the railway motor and the influence of the professor upon the working rate of the student. This banquet has become an established custom, and adds materially to the enthusiasm of the members.

After the banquet Mr. Rushmore addressed 125 members of the local branch on the subject of "The Application of Electricity to Steel Mills." The address was fully illustrated by lantern slides showing the processes in the making of steel, including the mining of the ore, its transportation and unloading, conveyance to the blast furnaces, and the rolling, sawing and drilling of the steel product. Especial attention was directed to the use of the electric motor in these processes, and an excellent idea was given of the hard service and rugged construction of these powerful motors.

The Anniversary Dinner of the American Institute of Electrical Engineers.

The anniversary dinner of the American Institute of Electrical Engineers, commemorating the twenty-fifth anniversary of the founding of the Institute, was held at the Hotel Astor, New York city, on Thursday evening, March 11. Louis A. Ferguson, president of the Institute, acted as toastmaster, and extended to the company present the welcome of the American Institute of Electrical Engineers. Telegrams were read from the German, French and English institutions of electrical engineers and from Alexander Graham Bell, Thomas A. Edison, C. F. Brush and others, congratulating the Institute and its members upon the attainment of its twenty-fifth anniversary.

President Ferguson outlined the organization of the Institute and stated that although it was the youngest it is now the largest of the four national engineering societies of America. He traced the growth of the Institute and its work, and pointed out the many ways in which the value of the Institute membership to engineers and manufacturers alike had been beyond estimate. The Institute has grown steadily, until it now numbers in its membership a total of 6,630. The cash assets amount to $45,000; the administration of the Institute's affairs demands considerable executive attention, the annual expenditure for administration amounting to approximately $80,000.

Jesse M. Smith, a charter member of the Institute, and president of the American Society of Mechanical Engineers, addressed the company for the sister engineering societies. Mr. Smith said that in these days of ponderous, powerful, highly efficient electrical machinery, we are apt to look back upon the birth of the society twenty-five years ago as the day of small things. However, the constant-current dynamos of Brush or Thomson, operating ten arc lamps in series, and the constant-potential dynamos of Siemens or Edison or Weston, operating 100 incandescent lamps in parallel, were of greater importance in their day and created more wonderment than the mammoth machines of the present.

Elihu Thomson responded to the toast, "The Charter Members." Professor Thomson sketched the early days of electrical endeavor, and said, that looking back to that time, the project for the formation of a new engineering society composed of electrical men may seem to have been somewhat ambitious. Never-

theless, there came together in response to a call a few men representing the different phases of electrical work then existent; men prominent in the development of telegraph, telephony and in the heavier work of lighting and kindred electrical applications. These were the charter members of the Institute, and by their efforts the beginnings of the important work of the body, which has continued on an increasing scale up to the present time, were made. It was his privilege, as president of the Institute, to represent it in London and at the Paris Exposition in 1889. It was a gratification to find at that time that, despite its youth, the Institute had become known abroad as a representative body in a new branch of engineering.

However full the public record of the doings of the society may be, there is a record which never reaches the press. It concerns valuable time and effort willingly spent in conducting the affairs of the society and furthering its work. It is this loyalty to the best aims and ideals which has given to the Institute that strength and representative position which it has held during the years since its organization.

President Ferguson stated that it had been a desire of the Institute to show some recognition of the charter members. It was suggested that this be done in the form of a diploma of congratulations, which should be presented at the dinner to each of the charter members living. Unfortunately, the time was so limited that the presentation of the diploma itself was impossible, and all that could be done was to read what will appear on it.

Frank J. Sprague responded to the toast, "The Past-Presidents."

In the twenty-five years of the Institute's existence there have been, including the retiring president, twenty-one presiding officers. Four of the number, Norvin Green, the first, and Houston, Duncan and Kennelly, have served two terms each. Mr. Sprague humorously spoke upon the question of what should be done with the past-presidents, and suggested that they should constitute themselves a body of Elder Statesmen, who, having received the highest honor from their associates, and having no further official ambitions, should be proud of the opportunity, as well as content in its employment, of aiding, by unselfish counsel and with matured judgment, in the administration of its affairs.

The organization has broadened until it has now become a great administrative body, with twenty-three sections and twenty-five branches.

Mr. Sprague's remarks led up to a eulogy of T. Commerford Martin, of whom he said, uprightness of journalistic standing and endeavor, catholicity of views, devotion to ideals, and untiring energy have marked his connection with the Institute, and all that it stands for. He was sure that the members of the Institute would consider him remiss if the celebration of this milestone in the Institute's advance should be permitted to pass without some specific reference to the senior past-president, Mr. Martin, and it gave him more than ordinary pleasure to bring to him this night formal greeting from certain of his official associates in the Institute, and as a special mark of high esteem in which he was held, to typify that regard in enduring fashion, by presenting a loving-cup, filled to the brim with all that loyal friendship and good-fellowship can express.

Following the presentation of the loving cup to Mr. Martin, Dr. Alexander C. Humphreys, president of Stevens Institute of Technology and past-president of the American Gas Institute, responded to the toast "Electrical Engineering as a Profession." Dr. Humphreys congratulated the members of the Institute and said he wished that he were one of the charter members. In no engineering specialty is liberal education and the ability to co-ordinate efficiently theory more of a necessity than in the electrical branch. There is a cultural value in the co-ordination of study if it correctly and adequately includes theory and practice. Today we need thoroughness, and to get this we must be specialists. Much of our schoolwork is superficial, but to overcome this we do not need to educate our youth to be narrow specialists if our educational schemes are wisely co-ordinated to include theory and practice.

After the close of Dr. Humphreys' address, President Ferguson called for "Auld Lang Syne," the solo part being sung by A. Foxton Ferguson, all present joining in the chorus.

National Electric Light Association Convention.

The Trunk Line Association has authorized a rate of a fare-and-three-fifths for a round trip, on the certificate plan, from all points in its territory to Atlantic City and return, for delegates to the twenty-second convention of the National Electric Light Association, to be held June 1, 2, 3 and 4.

New York State Public Service Law Upheld.

In a unanimous decision the Appellate Division of the Supreme Court of the State of New York on March 12 sustained the constitutionality of the Public Service Commissions law, which is chapter 429 of the Laws of 1907, entitled "An Act to establish the Public Service Commissions and prescribing their power and duties, etc."

The decision was made in sustaining an order made by Justice Gerard in Special Term, Part I, of the Supreme Court, denying the application of Adolph C. Gubner, suing as a taxpayer for an injunction *pendente lite* to restrain the city, Mayor McClellan, Comptroller Metz and the city chamberlain from paying any money to the Public Service Commissioners of the First district, "and from complying in any manner with the requirements set forth in chapter 429 of the Laws of 1907."

Last McAdoo Tunnel Bored.

The last of the Hudson & Manhattan Railroad Company's river tunnels from Manhattan Borough, New York city, into neighboring boroughs and New Jersey was blown through on March 11. It is known as the "North Tube," while the Cortlandt Street tunnel is called the "South Tube." The former will be used for westbound traffic.

It was five years, on March 11, that the work on the first of the tunnels was begun. Now it is believed that the trains will be running through the tube early in July.

A dinner was given at Sherry's in the evening to the president and directors of the Hudson & Manhattan Railroad Company and to the president and directors of the Hudson companies by Charles M. Jacobs and J. Vipond Davies, the chief engineer and deputy chief engineer, respectively, of these companies. The guests numbered 100.

Annual Convention of the American Institute of Electrical Engineers.

It has been decided to hold the next annual convention of the American Institute of Electrical Engineers at the Hotel Frontenac at the famous Thousand Islands, Frontenac, N. Y. The programme has not been completed. A preliminary arrangement of it will be announced in a few weeks. The convention will begin on Monday, June 28. Its duration will depend upon the length of the programme.

Iowa Independent Telephone Association.

The Iowa Independent Telephone Association met in convention at Des Moines on March 9 to 11, this being the thirteenth annual meeting of the organization. The attendance was much less than that expected, owing to the combination of a sleet storm and heavy snow following, which considerably demoralized railroad traffic and made it unpleasant, to say the least, for the telephone men. About 250 were registered. Routine business and the discussion of methods for securing full reports to the United States Census Bureau of the number of telephones in use by all independent companies occupied the time of the opening session.

On Wednesday papers were presented by William Crownover of Hudson on "Reasonable Connection Relations;" Howard S. Baker of Sioux City on "The Telephone from a Business and Investment Standpoint," and by President Shoemaker on "Reasonable Returns on Investment." Each treated elaborately his respective subject, President Shoemaker especially being the recipient of much congratulation on his effort. Manager Thill of the clearing-house presented a most encouraging report on the progress of his institution during the past year. Ex-President P. C. Holdoegel introduced a resolution which was adopted by a rising vote. It is especially pertinent because of the fact that the Iowa Legislature now has under consideration a bill providing for a public utilities commission. The substance of the resolution is as follows:

"The Iowa Independent Telephone Association, representng more than $10,000,000 of taxable property, all owned and operated by citizens of Iowa, declares frankly and firmly in favor of a public utility law governing all public service corporations.

"This association has never been in politics; but notwithstanding the tirade of misrepresentation of corporate interest by loose preachers of evil, we will continue to work in the open, and feel justified in making any suggestions and encourage any legislation we may deem beneficial to the public and our investors. The independent telephone corporations have almost without exception been fair to the public, and certainly deserve credit for farm life made more pleasant and increased volume of commercial business. The interest of the public, the corporation and the investor is identical, and knowing this, we protest against appeals to public prejudices and passions as being detrimental to all three interests and tending to force public service corporations to resort to unfair and dishonest methods; such appeals being made for the sole purpose of diverting public attention from the merits of the questions.

"By no other means than intelligent, stringent, nonpartisan and disinterested regulation can we hope to eradicate the evils of discrimination and convince both the corporation and the public that each will have a 'square deal' and thus bring stability to our business and confidence to the public and investor that is so necessary in order to secure capital to make improvements that are absolutely necessary for the progress and prosperity of our country."

On Thursday papers on "Value of Timber Preservation," by George H. Erich of Chicago, and on "Reasonable Accounting," by George R. Fawkes of Waterloo and C. A. Peterson of Manchester, were read by their respective authors.

The officers and executive committee of the past year were unanimously re-elected as follows:

President, J. H. Shoemaker of Waterloo; secretary and treasurer, W. J. Thill of Des Moines; executive committee: J. H. Shoemaker, J. C. Thorne, H. S. Baker, E. H. Martin and D. M. Griswold.

Waterloo was selected as the meeting place for 1910 after a spirited rivalry with Des Moines for the honor. As will be noted, a delightful spirit of "reasonableness" pervaded the entire convention, and the one least friendly to the independent telephone could have found no fault with the attitude displayed.

Assistant Electrical Engineer.

The United States Civil Service Commission announces an examination on April 21, 1909, to secure eligibles from which to make certification to fill a vacancy in the position of assistant electrical engineer, expert in wireless telegraphy, in the Signal Service at Large, at a salary of $1,500 to $1,800 per annum, depending upon the experience and qualifications of the appointee, and vacancies requiring similar qualifications as they may occur in any branch of the service.

The person appointed to the position for which this examination is held will probably be located for the major portion of his time in Washington, D. C., but he will also be required to travel about the United States visiting wireless telegraph stations, which visits may be of a few days or several months' duration.

Applicants must indicate in their applications that they have a good general knowledge of electrical science and that they are thoroughly familiar with wireless telegraphy and telephony both in theory and operation. Applicants whose applications fail to show that they have had sufficient training and experience to entitle them to a rating of at least seventy per cent in that subject, will not be admitted to the examination.

Applicants should at once apply either to the United States Civil Service Commission, Washington, D. C., for application form 1312. No application will be accepted unless properly executed and filed with the commission at Washington prior to the hour of closing business on April 10, 1909. In applying for this examination the exact title as given at the head of this announcement should be used in the application.

Union Switch and Signal Company Directors.

The annual meeting of the stockholders of the Union Switch and Signal Company took place March 9, in the office of the company, Westinghouse Building, Pittsburg, Pa. Owing to the absence of George Westinghouse in Europe, Col. H. G. Prout, vice-president of the company, acted as chairman. The financial statement was read to the stockholders, and an election of directors was held, with the following results:

George Westinghouse, Robert Pitcairn, William McConway, George C. Smith, Thomas Rodd, H. G. Prout, and James J. Donnell.

After the meeting, a representative of the company stated that the company has on hand at Swissvale at the present time orders for unfilled business amounting to $1,357,000. New contracts for block-signaling and other railroad safety devices are now coming in more freely than at any time during the last twelve months. Inquiries for quotations on new business are increasing and are widely spread over the entire country.

Under a decision handed down by the appellate division of the Supreme Court, the corporation counsel's office believes New York city can recover $750,000 from subsidiary companies of the old Metropolitan Street Railway. The claims are based on the law requiring railroad companies to keep in repair pavements between their tracks.

ALTERNATING CURRENTS AND THEIR APPLICATIONS.

BY EDSON R. WOLCOTT.

CHAPTER V. (PART III.)—THE CONVERSION OF ALTERNATING CURRENTS.

STARTING ROTARY CONVERTERS.

A rotary converter may be started as a direct-current shunt motor and connected to the line when synchronous speed is reached. Direct current is not usually available where converters are used and

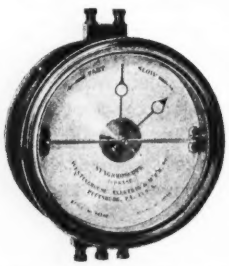


FIG. 130.—SYNCHROSCOPE.

it is customary to provide a separate motor for starting the converter as a synchronous motor. It is not considered advisable to start it as a synchronous motor by any of the special methods already mentioned because of difficulties in construction, nor is it advisable to start the converter directly from the mains, as its heavy starting current may affect the other apparatus connected to the line. Of

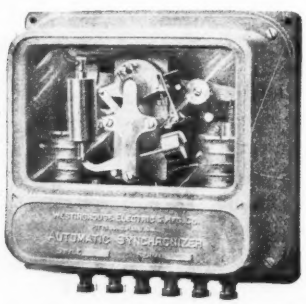


FIG. 131.—AUTOMATIC SYNCHRONIZER.

course if the capacity of the transmission line is very large compared to that of the rotary converter, no difficulties would arise, but this case is not usual.

The separate motor used in starting the converter is usually mounted on the same shaft as already illustrated. It should be arranged to bring the converter up to a little above synchronous speed.

THE SYNCHROSCOPE.

Synchronizing may be accomplished by the methods already described in the chapter on motors, but there are instruments for showing whether the speed is too fast or too slow, a condition that cannot be determined when electric lights are used. Such a device, or synchroscope, as it is called, is illustrated in Fig. 130. This instrument not only shows whether the incoming machine is too fast or too slow, but also the relative amount. The phase angle between the converter and the generator is registered as the angle between the pointer and its vertical position as marked on the dial of the instrument. If the frequency of the incoming machine is higher than that of the line, this angle will vary, causing the pointer to rotate in one direction. If the incoming machine is lower in frequency the pointer will rotate in the opposite direction. "Fast" and "Slow" on the dial mean that the frequency of the rotary is higher or lower than that of the line.

THE AUTOMATIC SYNCHRONIZER.

The construction of the automatic synchronizer permits adjustments to be made for the synchronizing conditions deemed advisable for safe operation, and guarantees that no machines will be thrown on the system until these conditions are fully satisfied.

The device consists essentially of two solenoids acting on cores hung upon opposite ends of a rocker arm, as illustrated in Fig. 131. The solenoids are connected so that the right-hand end of the rocker is at the extreme lower end of the stroke when the electromotive force of the machine to be synchronized is in phase with the electromotive force of the bus-bars, and is at the upper end of the stroke when the phases are in opposition. This causes the rocker arm to oscillate up and down in time with the fluctuations of synchronizing lamps if they are also used. When the right-hand end of the rocker arm approaches its lower position at a sufficiently reduced speed a contact is made which closes the circuit of an auxiliary relay that in turn closes the circuit operating the closing coil of the main switch. The closing of the contact occurs a sufficient length of time in advance to permit the main switch to complete the circuit at the exact point of synchronism. The synchronizer does not make contact at all, unless the difference in speed of the two machines is less than the predetermined amount.

The automatic synchronizer is operated by means of a drum-type controlling switch, mounted at a convenient position on the switchboard. One such outfit can be used in connection with a number of rotaries.

CONNECTIONS FOR ROTARY CONVERTERS.

In the following illustrations are shown methods of connecting rotary converters and their starting motors to two-phase and three-phase systems. In Fig. 132 is disclosed a method of connecting a rotary converter to a two-phase system and also for obtaining a lower voltage for the starting motor. Phase A is connected to the armature winding through transformer No. 1 at A_1 and A_2. Phase B is connected to the armature winding through transformer No. 2 at B_1 and B_2. The two-phase starting motor is connected

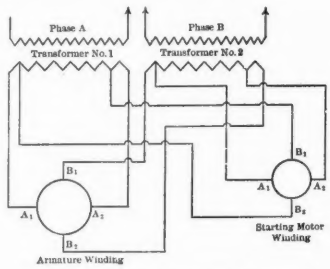


FIG. 132.—TWO-PHASE SYSTEM.

over only a part of the transformer coils and the voltage across the motor is thereby reduced to any desirable value less than that of the terminals of the secondary of the transformer by connecting to different coils of the latter.

In Fig. 133 a method of obtaining a

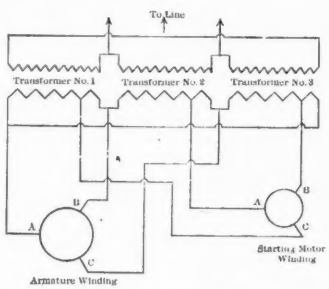


FIG. 133.—THREE-PHASE DELTA SYSTEM.

lower voltage for a starting motor on a three-phase delta system is shown. It will be noticed that all of the primary coils of the three transformers are connected in series and that all three of the secondary coils are also in series, which is the case in the delta system. The terminals of the armature winding of the starting motor are connected as shown, and the voltage between them is less than that applied to the armature of the rotary converter.

A method of connecting the rotary con-

verter to a three-phase star-connected system is shown in Fig. 134. Three transformers are used as before. One terminal of each primary coil of the three transformers has a common connection, as does also one terminal of each of the secondary

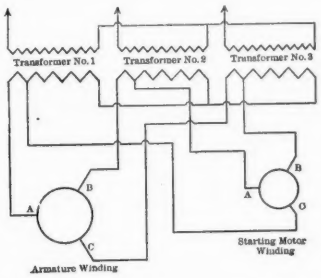


FIG. 134.—THREE-PHASE STAR SYSTEM.

coils, according to the star system of connection.

The direct-current connections are not shown in the above diagrams.

HUNTING OF CONVERTERS.

To give the best service rotary converters must run in exact synchronism with the supply current. If the speed of the generator varies, this is difficult to main-

FIG. 135.—ROTARY CONVERTER FIELD, SHOWING GRID DAMPERS.

tain, since the rotary will tend to follow the fluctuations of the generator; the result is a surging action of the armature of the rotary first above and then below synchronism, that is—hunting. This is always accompanied by a shifting magnetic field and can be materially reduced by attaching heavy copper grids around and across each pole-piece, as illustrated in Fig. 135. These grids act as dampers, similarly to those used in galvanometers; the action is analogous to that of the dashpot of an engine governor. The shifting magnetic flux which occurs during hunting cuts the grids and induces therein eddy currents which retard the converter armature.

EFFICIENCY.

The losses occurring in rotary converters are about the same as in direct-current generators of similar capacity. Good commutation is more easily obtained in rotary converters than in direct-current generators.

INVERTED ROTARY CONVERTERS.

When a rotary converter is driven by direct current and delivers an alternating current, it is called an inverted rotary converter. This type is used in supplying alternating from a direct-current generating plant to a distant station for use in lighting, power, or perhaps to be again converted into a continuous current. Such a machine is also sometimes used for converting the direct current from a storage battery into an alternating current.

Inverted converters are usually excited by a special exciter directly connected or run from a motor. The exciter is so arranged that its voltage is increased considerably on a slight increase in speed of the converter; a stronger magnetic field is then produced, which tends to decrease the speed of the converter, so that approximately constant speed is maintained.

USE OF TRANSFORMERS WITH ROTARY CONVERTERS.

It is advantageous to operate rotary converters at a much lower voltage than that which is economical for the transmission of electrical energy. For this reason transformers are usually used with rotary converters, particularly in substations.

By the combined application of high-tension alternating-current transmission of electrical energy and rotary converters it is not necessary to build a generating station near the consuming end of the circuit. It is, in fact, often advantageous because of engineering and financial reasons to build the generating plant at some distance from the place where the energy is used. Substations are then built at convenient places and equipped with step-down transformers and rotary converters if direct current is to be used, so that the transmission can be by means of high-tension alternating current.

Omaha Electrical Exposition.

The second annual electrical exposition will be held at the Omaha Auditorium, Omaha, May 6 to 15. The Omaha Electric Light and Power Company will make an elaborate exhibit and the Nebraska Electric Light Association will hold its annual convention during the exposition. The president of the exposition is Geo. W. Johnston; the secretary, Wilbur L. Burgess, and the manager, J. M. Gillan.

The Mackay Companies.

The Mackay Companies' plan, through its Commercial Cable Company, to lay the first cable line between New York and Newfoundland, connecting there with the cable to Europe, will, it is announced, give facilities for more direct cabling to Europe than now exist, and will reduce the time of transmission from thirty per cent to thirty-five per cent.

The new line will involve the laying of about 1,700 miles of cable and will cost at least $1,500,000, with the possibility of exceeding that amount by one or two hundred thousand dollars. This expense will be borne entirely by surplus or current earnings.

One of the Nova Scotia cables will be tapped about 300 miles at sea and a new line run into Newfoundland, and messages automatically relayed from Newfoundland over the new cable to New York. The other Nova Scotia cables will continue as at present.

The opening of this Newfoundland cable route will give the Mackay Companies close to 30,000 miles of cable, of which about 20,000 miles is in the Atlantic and 10,000 miles in the Pacific.

Waterpower Wanted for Air-Nitrate Factories.

Representatives of European interests manufacturing air nitrates by hydroelectric power for fertilizers are in the United States to see what can be done in the way of securing large waterpowers for establishing such factories in this country. An industry of this kind is needed, as the imports of Chilean nitrate of soda now amount to $14,000,000 a year. Difficulty is being experienced, however, in securing suitable waterpowers at reasonable cost. Governments of other countries are said to be offering inducements for the location of the extensive nitrate mills which the company proposes to erect.

Twin City Rapid Transit.

C. G. Goodrich, acting president of the Twin City Rapid Transit Company of Minneapolis, Minn., in a letter to the Minneapolis Board of Aldermen, withdraws the request formerly made that the city discontinue its suit against the company for "six-for-a-quarter" fares, and says the company now prefers to let the matter go through and await the decision of the United States Supreme Court, which will fix the status of the company with reference both to fares and the life of its franchise.

Electrical Equipment of Peter Doelger's Brewery.

The equipment of Peter Doelger's Brewery, Fifty-fifth Street and First Avenue, New York city, has excited comment throughout the country because of the fact that all of the malt-handling machinery is controlled from one operating board.

This board, shown in Fig. 1, is situated in the mill room on the fifth floor. From it the malt is handled from the time it is delivered to the brewery until it is introduced into the mash tubs. The various switches on the board control automatic self-starters which operate the motors individually, and the pilot lamps above the switches indicate when each motor is in operation. In this way the elevators, screens, blowers, dust collectors and conveyors on the various floors are controlled.

The malt is dumped from the wagon into a hopper, and the operator is notified by telephone. He closes the switches to start the motors for the main elevator, the malt screen, the blower and the dust collector. Ten seconds after receiving the telephone message, all of this machinery is in operation and continues to run until he stops it. No running about from room to room or from floor to floor to throw clutches or to start motors is necessary, as all of this is done automatically by closing the switches on the operating board.

The motor operating the main elevator, situated on the seventh floor, is shown in Fig. 2. It is of twenty-horsepower capacity, and runs at 775 revolutions per minute. It is back-geared, and drives the elevator through a Morse chain. The total speed reduction through gearing and chain is in the ratio of eighteen to one. The self-starter for this motor, controlled from the operating board, is also shown in the photograph.

Fig. 3 shows the motors driving one of the malt screens and the blower and the dust collector on the seventh floor. This apparatus is used in cleaning the malt. A thirteen-horsepower motor, running at 1,000 revolutions per minute, is directly connected to the blower, which draws air through the screen and forces it into the dust collector. A one-horsepower motor, at 1,780 revolutions per minute, drives the dust collector, through a chain belt. In this machine the dust-laden air is forced through canvas tubes. The air is forced through the canvas and leaves the dust, which is scraped off by the machinery, to fall to the bottom, where a conveyor scrapes it all into a barrel. After being cleaned, the malt drops into a storage bin on the sixth floor. When ready for use, the malt is elevated, by means of a motor controlled from the operating board, to the weighing hopper. This hopper is located on the sixth floor, but the scale arm is in the operating room. The operator sets the scale and starts the motor. When a sufficient quantity of malt is weighed out, as indicated by the arm rising, he stops the motor. After a sufficient quantity is weighed out, the opening of a chute permits the malt to descend, by gravity, to the mills. These are located in the op-

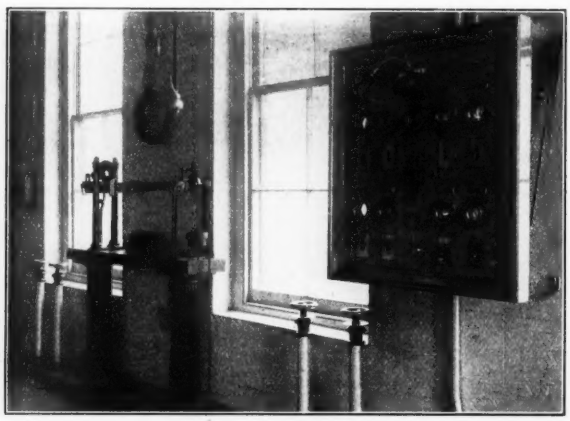


FIG. 1.—OPERATING BOARD AND WEIGHING ARM OF 2,000-POUND SCALE, WITH CHUTE SLIDE LEVERS.

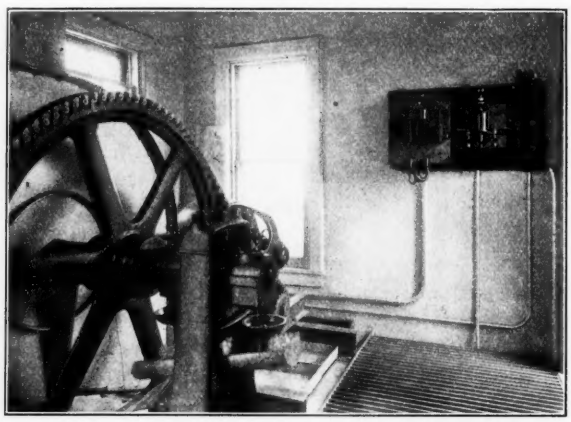


FIG. 2.—TWENTY-HORSEPOWER GEARED MOTOR DRIVING MALT ELEVATOR, IN PETER DOELGER'S BREWERY.

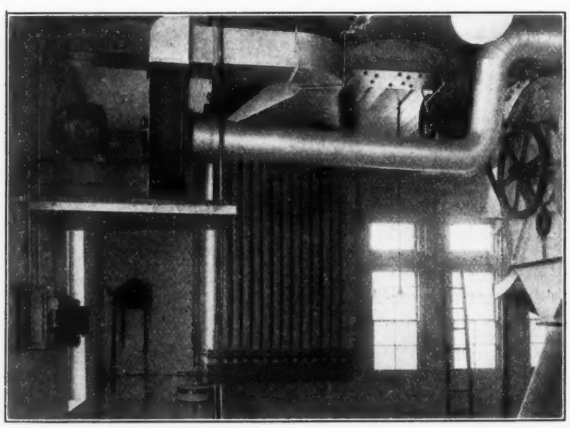


FIG. 3.—MOTORS DRIVING BLOWER, MALT SCREEN AND DUST COLLECTOR, IN PETER DOELGER'S BREWERY.

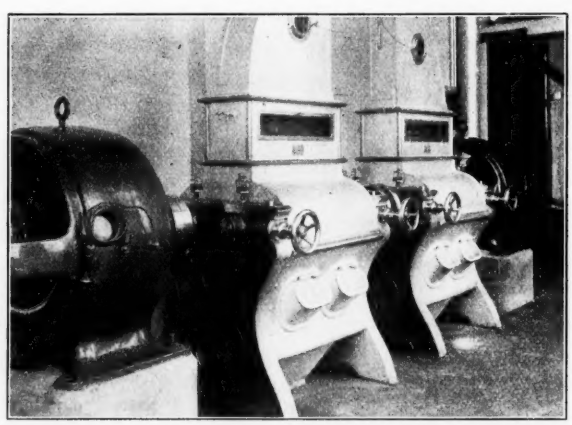


FIG. 4.—TWO TWENTY-FOUR-HORSEPOWER MOTORS DRIVING MALT MILLS IN PETER DOELGER'S BREWERY.

erating room, because during this operation it is necessary to watch the malt to prevent explosions. Permanent magnets are provided in the mill to catch any iron nails, etc., before the malt is ground, as

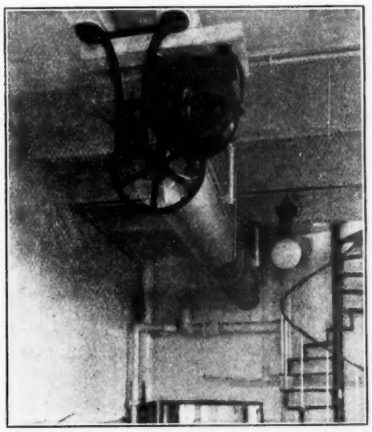


FIG. 5.—MOTOR DRIVING CONVEYOR UNDER MALT MILL.

even a slight spark would cause an explosion. The two mills are shown in Fig. 4, each driven by a twenty-four-horsepower motor running at 750 revolutions per minute, with starters mounted on the wall.

On leaving the mill, the crushed malt is carried, by means of the horizontal conveyor, shown in Fig. 5, to the mash tubs. This conveyor is direct-connected to a five-horsepower, 1,000-revolutions-per-minute motor, controlled from the operating board.

All the operations described above are thus carried on by one man from one

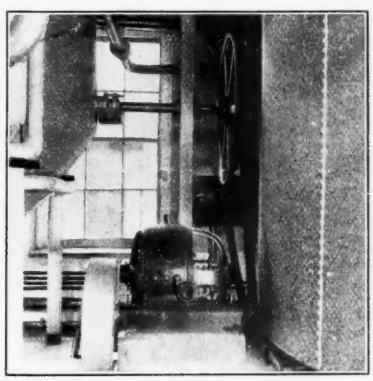


FIG. 7.—FIFTEEN-HORSEPOWER MOTOR DRIVING AGITATORS IN RICE COOLERS.

room. The advantages of this system are so apparent that they need not be enumerated.

In addition to those motors controlled from the operating board, there are a number of motors driving various kinds of machinery in the brewery. Fig. 6 shows two thirty-five-horsepower motors driving the agitators of two mash tubs. These motors run at 475 revolutions per minute and drive the agitators, through chain belt and gearing, at twelve revolutions per minute. Owing to the enormous inertia of the agitators, a special style of starting device is necessary to prevent too sudden starting of the motor. This consists of an interlocking multiple-switch starter, with overload release on the first switch. In case the switches are thrown too quickly, the first switch is released, which makes it necessary to commence the operation of starting over again.

The rice cookers are also motor-driven by fifteen-horsepower, back-geared motors like that shown in Fig. 7.

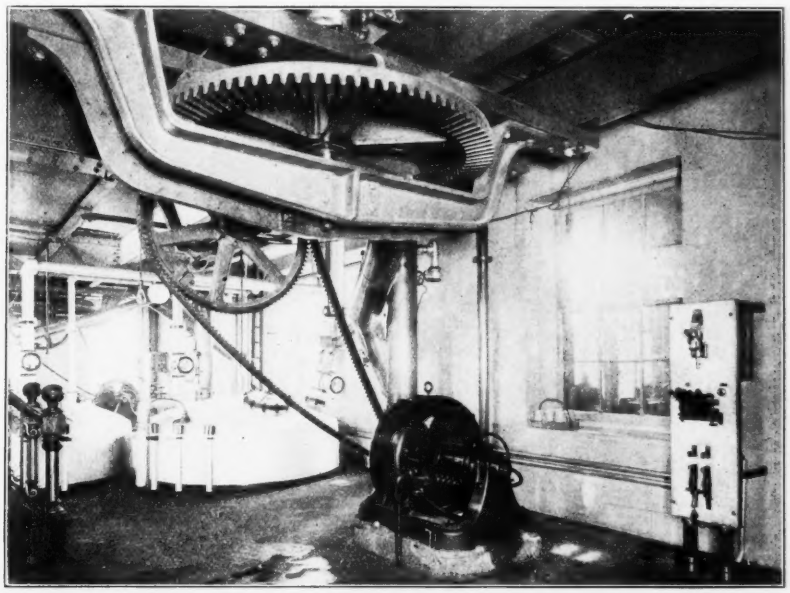


FIG. 6.—THIRTY-FIVE-HORSEPOWER MOTORS DRIVING AGITATORS IN MASHTUBS AT TWELVE REVOLUTIONS PER MINUTE.

There are in all twenty-four motors in this brewery, aggregating 300 horsepower. These were all built by the Crocker-

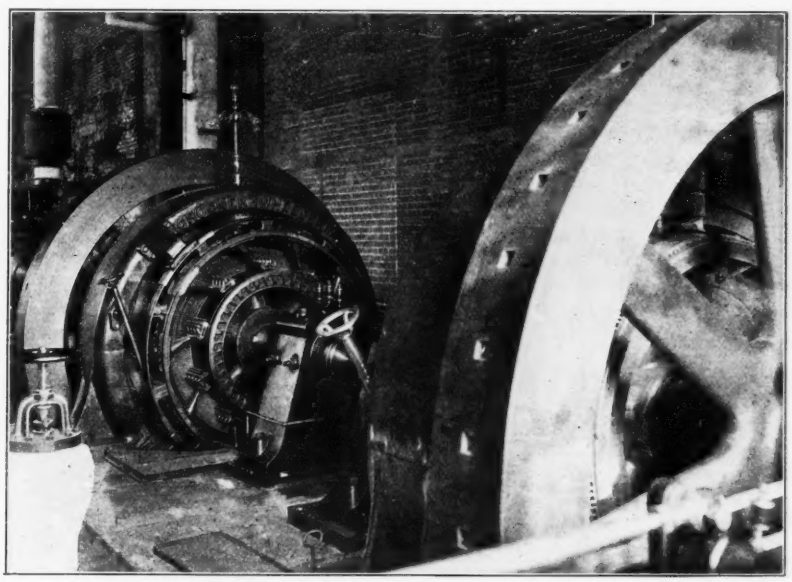


FIG. 8.—CROCKER-WHEELER DIRECT-CURRENT GENERATORS, IN PETER DOELGER'S BREWERY, NEW YORK CITY.

Wheeler Company, of Ampere, N. J. A number of them are used to drive the machine tools in the repair shop, where all repairs to the brewery equipment are made. In this repair shop every machine is individually motor-driven. The shop

contains a Hamilton planer, a nine-inch and a two-inch pipe-threader, a drill press, an eighteen-inch lathe, driven by an adjustable-speed motor, and a saw.

Throughout the entire brewery there is not a single belt transmission. Where, because of large speed reduction, direct-connection of gearing has not been practicable, a short chain-belt is used. In a recent interview the brewmaster stated that during the entire year that the motors had been in operation not one dollar had been spent for repairs to motors or transmission devices. While this result is better than can be expected ordinarily, it demonstrates that with the proper motors the saving in repairs will very soon offset the cost of the motor installation.

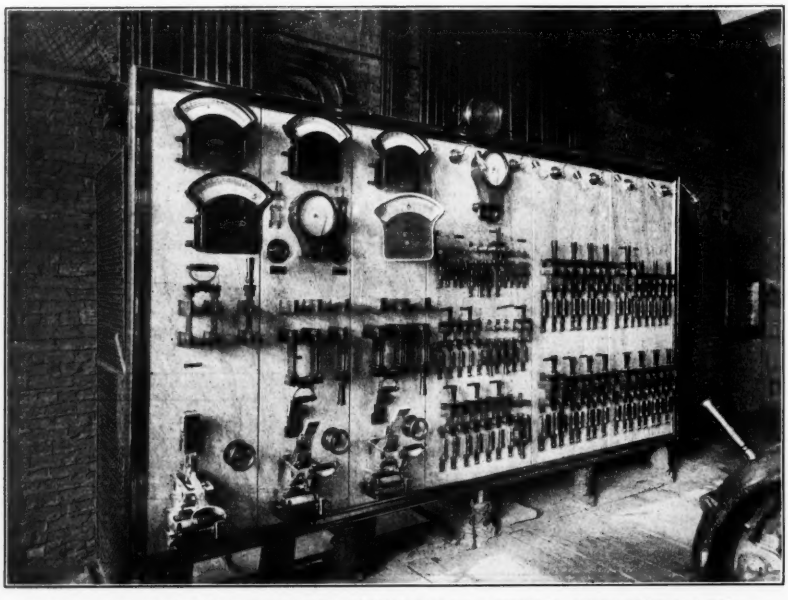


FIG. 9.—SWITCHBOARD IN PETER DOELGER'S BREWERY, NEW YORK CITY.

The power for motors and for the electric lighting throughout the building is generated in the engine room of the brewery. The generating equipment consists of two Crocker-Wheeler generators, direct-connected to Watts-Campbell engines. One of these sets has a capacity of 200 kilowatts and the other of 150 kilowatts. Both are driven at 100 revolutions per minute and deliver current at 125 volts. There is also a small turbine set used for generating current for lighting only, when the machinery is not in operation. The main generators are shown in Fig. 8 and the switchboard in Fig. 9.

The electrical equipment was installed by Blackall & Baldwin, 39 Cortlandt Street, New York city, according to specifications by A. G. Koenig, M. E., who has made a specialty of installations of this character.

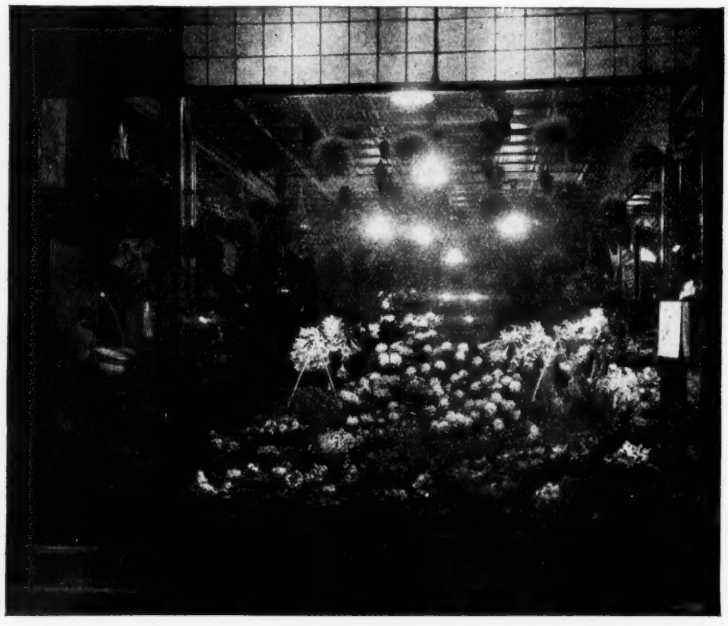
A Well-Lighted Store.

The progressive merchant realizes fully the advertising value of a well-lighted store and windows, and an actual installation which shows a decided improvement over methods hitherto considered satisfactory, and affording at the same time ample evidence of reduced operating expense, will always receive his careful consideration.

The store of S. A. Anderson, located at 440 Main Street, Buffalo, N. Y., illustrated herewith, is a good example of the economical and highly efficient lighting effect obtained by the use of tungsten lamps in combination with Holophane reflectors. The illustration was reproduced from an unretouched night photograph.

Prior to the installation of these lamps the store was lighted by three enclosed arc lamps and the windows by means of fifteen sixteen-candlepower carbon incandescent lamps mounted in a reflecting gutter. Under the old conditions the store was as well lighted as its neighbors, but since the installation of the tungsten lamps, it stands out conspicuously as an example of effective illumination.

As the very practical question of cost is of vital importance in store illumination, it is interesting to compare the amount of current consumed under the old and new conditions, bearing in mind at the same time that with tungsten lamps the quality of light obtained is far superior to that obtained under the old conditions. In the store there were formerly installed three five-ampere, 110-volt, direct-current arc lamps, having a total current consumption of 1,650 watts. The new equipment consists of four General Electric 250-watt tungsten lamps with the lower portion of the bowl frosted and provided with satin-finished Holophane glass reflectors. They give twice the effective illumination obtained from the use of the arc lamps, and with a cur-



AN EXAMPLE OF LIGHTING A STORE DISPLAY WINDOW WITH TUNGSTEN LAMPS AND REFLECTORS.

rent consumption of only 1,000 watts as against 1,650 watts. This is a forty per cent saving, giving a reduction of forty per cent in the bill for the same hours' use of the lamps, or else sixty-five per cent longer use, for the same cost.

In the window fifteen sixteen-candlepower fifty-watt carbon incandescent lamps were formerly used, with a current consumption of 750 watts, and gave an effective illumination of 240 candlepower. These were replaced by three 250-watt tungsten lamps similar to those in the store, and equipped with the same satin-finished reflectors. The current consumption in this case was the same as with the carbon lamps, *i. e.*, 750 watts, but the effective illumination was more than three times as great, being 750 candlepower as against 240 candlepower. In addition to this, it should be remembered that the periodical disturbance caused by trimming arc lamps is altogether avoided, as the tungsten lamp has an effective life of 800 hours, and, unlike its predecessor, the carbon lamp, will maintain its full lighting efficiency throughout its effective life. The light is not only evenly diffused, but the slight variations in voltage which occur in the average lighting circuit, will not cause any flickering in the tungsten lamp; its light remains steady.

London, Brighton and South Coast Single-Phase Railway.

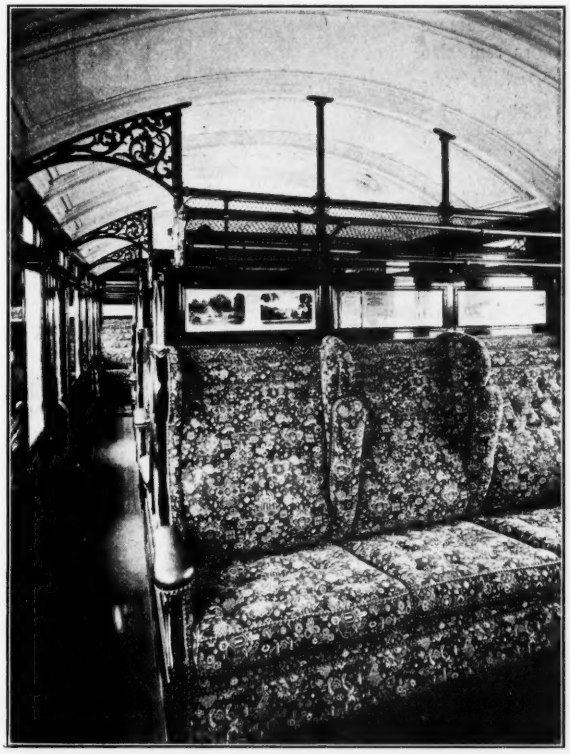
BY A. WEBSTER.

London, February 3.—Progress with the electrification of the South London line of the London, Brighton and South Coast Railway Company, upon the single-phase system, has been so rapid during the past few months that a trial trip was made at midnight on Sunday with complete success. In the previous trial trips the electric cars have been hauled by steam locomotives, in order to test them so far as the track has been concerned, but upon the trip on Sunday the electric current was switched on, and everything went through without a mishap, either to the equipment or to the party of officials and press representatives that had been invited. The following detailed description of the undertaking is made possible by the courtesy of the officials of the railway company:

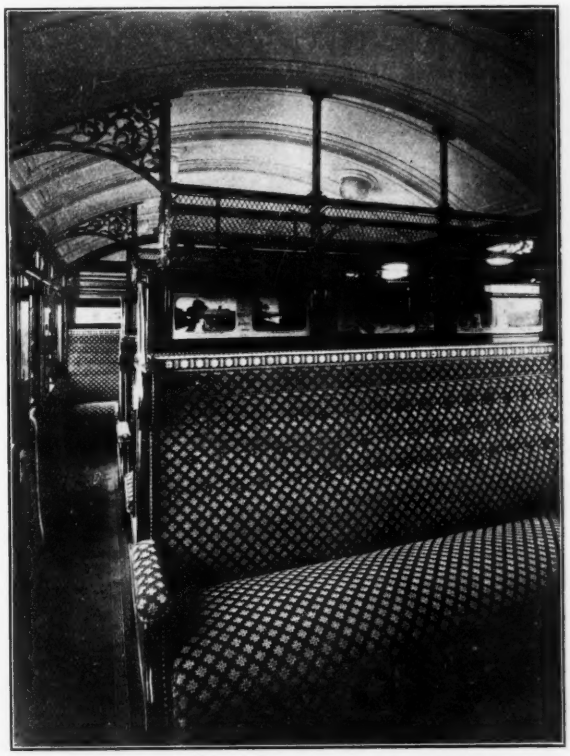
The line at present being electrified is known as the South London line and extends from Victoria to London Bridge, via Battersea, Wandsworth Road, Clapham, East Brixton, Denmark Hill, Peckham Rye, Queens Road, Old Kent Road and South Bermondsey to London Bridge, and is just under nine miles in length.

At the present time the section from Battersea to East Brixton is completed, and within a couple of weeks the equipment will have been extended as far as Peckham Rye. It is over this section that the experimental running has been taking place and that the tests have been carried out, in order to verify the very stringent guarantees given by the contractors. It is also on this section that the motormen will be instructed.

The repair shops and car sheds are now under construction near Peckham Rye, and it is expected that this work will be completed within the next few months. It is here that the electric trains not in service will be kept, and where the whole equipment will be regularly examined. To these shops will also be transferred the telegraph, telephone and other electrical repair sheds now at New Cross. The whole of the electrical rolling stock and maintenance thereof, as well as the supervision of the whole of the electrical equipment of the line, will be under the direct and entire supervision of E. J. Houghton, the electrical superintendent of the company. The repair shops at Peckham Rye are in telephonic communication, by means of special circuits, with



INTERIOR, FIRST-CLASS COACH, LONDON, BRIGHTON & SOUTH COAST RAILWAY.



INTERIOR, THIRD-CLASS COACH, LONDON, BRIGHTON & SOUTH COAST RAILWAY.

the electric switch cabins, which are situated at, or near, each of the stations and from which the electrical operation of the whole of the line can be controlled. The apparatus accessible ordinarily in these cabins is entirely on the low-tension side and obviates therefore any risks in operating. It is designed to be of the simplest form possible, so as to enable the ordinary station staff to work it, should this at any time be found necessary.

The single-phase system was decided upon after most careful consideration, and since its adoption it must be confessed that the majority of railway engineers, at any rate in Great Britain, have concluded that there is much to be said for it; it may almost be said that it is regarded as the most suitable for any portion of a main-line railway. Further, Herr Geheimrath Wittefeld, the principal adviser and chief engineer to the Prussian minister of public works, who has had experience with both systems of electric traction on the Prussian State Railways, has definitely advised his government that for future railway electrification the single-phase system is the only one worth considering. The objections from the traffic and maintenance point of view of insulated third and fourth rails, owing to the very complicated nature of the junctions and sidings, put this system practically out of the question. Furthermore, the dangers to the employes of the railway, both mechanically and electrically, as well as the increased cost of maintenance and repairs, and the delays which may arise in consequence of derailment damaging the third rail, are such as to have put this system out of court in the case of the Brighton Railway.

All the high-tension apparatus, which is of the simplest nature, is enclosed in an entirely fireproof steel compartment, and access to it can only be obtained after the current is cut off and the whole apparatus connected to earth, thereby rendering it absolutely safe. This is obtained by a very simple interlocking arrangement which is absolutely efficacious. All the current for lighting and control, and in fact every circuit to which it is possible to obtain access while current is on, in no case exceeds 300 volts.

The overhead wire is supported at intervals of every ten feet from two steel messenger cables. Current is taken off by means of a collector bow which is kept pressed against the overhead copper wire by means of springs, which are brought into action pneumatically. The contact strips of these collector bows are composed of aluminum, fitted with grooves filled with heavy grease, and the upward pressure against the wire necessary for proper contact amounts to but a very few pounds, so that wear on the copper working conductor is not appreciable, the whole wear practically taking place on the aluminum strip, which can be easily and cheaply renewed. The current from the bow is taken into the high-tension chamber on the car and is then conducted in lead-covered cables laid in metal casing to the two transformers situated under each motor car; from here low-pressure current is taken to the motors and also to the controlling apparatus, which consists of contactors or switches and is situated at the side of the coach underneath the frame.

The rolling stock at present constructed consists of eight trains; each train is made up of three coaches. The centre coach is not equipped electrically and is entirely devoted to first-class passengers. The two end coaches are each fitted with four 120-horsepower single-phase motors, designed by Dr. Eichberg, the inventor of this type of compensated repulsion motor.

There are several features which are entirely novel to be observed in connection with this rolling stock. Contrary to all the other electric railways which have adopted the American type of coaches with end doors, the Brighton company has adopted sidedoor carriages, which, it is believed, will prove more satisfactory to the traveling public and all concerned. This design embodies all the advantages of the compartment carriage without its disadvantages and enables ample seating capacity and light to be provided, even if occasionally in consequence of overcrowding passengers might have to stand. Each third-class coach has eight passenger compartments, in which a normal accommodation is provided for seating sixty-six passengers, but eighty-two people can be seated without discomfort. The first-class coach comprises nine compartments and normally seats fifty-six passengers, but it will quite easily furnish seating accommodation for seventy-four. The seating capacity per train is therefore 238 passengers. In order to facilitate even distribution of passengers a gangway has been provided whereby, in case of one compartment being full, a passenger can easily find his way into the next; these passageways are by no means similar to a corridor coach which would not be at all suitable for the purpose of local traffic, but they are so arranged that on one half of the carriage they are situated on one side, whereas on the other half they have been located on the opposite side.

A particular feature of the train is the lighting provided by a double circuit of lights, each compartment being fitted with two Holophane globes containing two ten-candlepower lamps, or forty-candlepower to each compartment. By means of this arrangement an absolutely even distribution of light is obtained with practically no shadows, and the light being evenly diffused is not disagreeable to the eye, notwithstanding the brilliant illumination.

Every precaution has been taken to prevent fire risk, the sides, roof and bottom of the coaches being entirely covered with sheet aluminum and the bottom of the coach being furthermore covered with heavy asbestos sheeting, in addition to which, between the floor boards, a large space which is left has been filled in with slag wool. Each coach is mounted on two pressed-steel bogies with forty-two-inch wheels and eight-foot wheel base. The over-all length of the coach is sixty feet and forty-one feet between bogie centres, the cross width being nine feet. Besides ordinary hand brakes, Westinghouse air brakes are installed on the trains.

The contractors for the whole work, with the exception of the coaches themselves, are the Allgemeine Elektricitäts Gesellschaft of Berlin, who were entrusted with the contract in consequence of the very favorable terms and the very satisfactory guarantees as regards efficiency and operation put forward by them. It was, however, stipulated that everything that was possible should be of British manufacture, with the result that with the exception of the electrical equipment of the trains, practically the whole of the work has been carried out by British workmen and with British material.

Work Started on Pennsylvania Electrification.

The Westinghouse Electric and Manufacturing Company has started work on the $5,000,000 contract given it by the Pennsylvania Railroad for the electrification of its New York terminals, including the tunnels and terminals at Jersey City and Long Island, according to an announcement by Westinghouse officials.

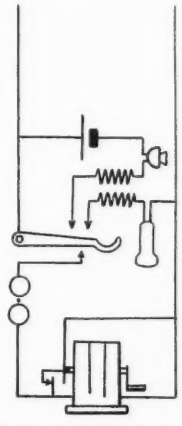
QUESTIONS AND ANSWERS.

INSULATING AND GROUNDING WIRELESS-TELEGRAPH MASTS.—Please give in your columns a good method of insulating and grounding wireless-telegraph masts when installed on buildings.—A. H. R., North Abington, Mass.

Wireless-telegraph masts themselves do not need to be insulated from ground; they are merely a support for the aerial wire or antenna. The latter, however, must be thoroughly insulated from the mast, from buildings and from any electrical connection with ground to insure absence of leakage of current. This may be done by using well-insulated wire and supporting it only by means of heavy porcelain or glass insulators. The latter may be supported by tarred rope, so as to secure a double insulation. A good way is to pass the aerial through a porcelain bushing with a groove about its outer surface, in which groove the tarred-rope guy-wires are secured. A good way to pass the aerial into the building is through a porcelain bushing mounted in the centre of a glass window-pane. The ground connection should be handled in a similar way, the actual ground being made to a copper plate buried in moist earth.

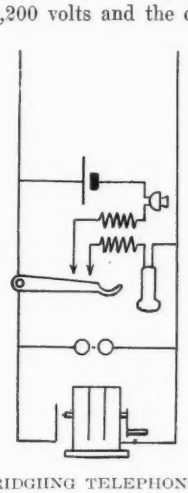
ALTERNATING-CURRENT PROBLEMS.—(1) Can three-phase, 6,600 volts, be run on two, three or four wires, and which works best? (2) Is it possible to use one phase of a three-phase system, and, if so, how are the other phases balanced? (3) In running 6,600 volts through transformers and reducing it to 2,300 volts, does it increase the amperage? (4) Is it possible to run alternating current into a transformer and get direct current of a lower voltage from it? (5) What is meant by a ratio of twenty to one in speaking of transformers? (6) What is a rotary converter? (7) When calibrating with a master meter whose constant is one-third and the service meter has a constant of two-thirds, how many revolutions should the service meter make when the master meter reads eighteen in one minute? What if the service-meter constant were one-fifth, one-eighth or one-fourth?—N. V. L., Dubuque, Iowa.

1. Three-phase circuits require either three or four wires, the former with either the delta or star connection and the latter with the star connection, using a fourth common-return or neutral wire. The four-wire system is used only where considerable unbalanced load may be expected or where it is important to reach the neutral point of the system. 2. Any one phase may be used alone or predominatingly. If used alone, no balancing is necessary, since the other phases are idle and their voltage is unimportant. In this case there is no advantage in having a three-phase machine. If one phase is used predominatingly, it is desirable to use potential regulators to keep the voltage at the right value, if it is impossible to provide increased load on the other



SERIES TELEPHONE.

phases to maintain an approximate balance. 3. In stepping down the voltage the current is increased in practically the same ratio. 4. No. 5. A ratio of twenty to one in a transformer means that the voltage on the primary circuit is twenty times that on the secondary, and the current in the latter is twenty times that in the primary. Thus, if the primary voltage were 2,200 volts and the current five



BRIDGING TELEPHONE.

amperes, then the secondary voltage would be 110 volts and the secondary current practically 100 amperes. 6. A rotary converter is a dynamo-electric machine with a rotating armature into which alternating current is passed from one end by means of collector rings and from which direct current is taken at the other end by means of a commutator and brushes; the operation can also be inverted so that direct current supplied to the machine is converted by it to alternating current. 7. If the master meter makes eighteen revolutions per minute with a constant of one-third, the service meter will make nine in the same time, provided its constant is two-thirds. Should the latter's constant be one-fifth, its rotations would be thirty per minute; with a constant of one-eighth the rotations would be forty-eight; with a constant of one-quarter the rotations would be twenty-four while the master meter made eighteen per minute.

SERIES AND MULTIPLE TELEPHONES.—Can a series party telephone be cut over so as to work successfully on a multiple system in addition to the regular multiple telephones? If so, what is the proper way to do it? Can multiple telephones be changed to work successfully in series with series telephones, and how? How many batteries should be used on a metallic-circuit telephone line one mile long using No. 12 galvanized-iron wire? Is there danger in putting on too many?—B. E. M., Seattle, Wash.

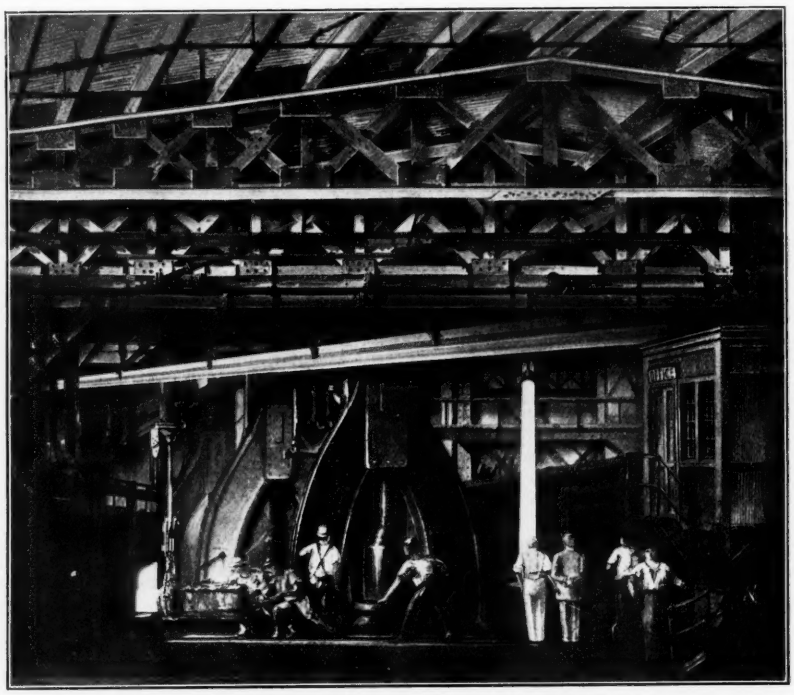
The talking circuits of both series and multiple (bridging) telephone sets are similar, as shown in the accompanying diagrams. The difference lies in the construction and connection of the signaling apparatus, *i. e.*, the bells and the generators. As the bridging bells are paralleled they must have a higher resistance (about 1,000 to 1,600 ohms) than the series bells (eighty to 100 ohms), since the multiple connection requires that the current be divided among the ringers. If the ringer resistances in a bridging system were very low, compared with the line resistance, the bell nearest the calling station would take an undue proportion of the current, while the distant bells might fail to operate. In addition to their higher resistance, bridging bells are wound to present a very high impedance to the high-frequency voice currents, since these bells are ordinarily permanently bridged across the line. For obvious reasons it will be noted that the series ringing generator has its contacts so arranged as to short-circuit its own winding until the crank is turned, while the bridging magnet holds its circuit open until the armature is set in motion, then automatically completing its connection. If the changes indicated by the above are made, the two kinds of telephones may be interchanged. Two cells per station should serve well on the short line described, if the apparatus and insulation are in good shape. Too much battery power may heat up the transmitter, defeating the end of improved transmission.

The Part of Electricity in the Play "Via Wireless."

The numerous applications of electricity and electrical effects to the production of the elaborate scenic illusions of modern stagecraft are exemplified to an unusual degree in Frederic Thompson's production of "Via Wireless," now playing at the Chicago Opera House, Chicago. As facetiously remarked by one of the mechanical staff, in spite of the name of this play, its presentation as given probably requires more wiring and running of cables for power, light and signaling circuits, than any other scenic or dramatic production.

Electricity plays an important part in this performance, both in the production of principal and incidental effects and in the story of the play itself, which reaches its crisis in the scene of the "wireless" room aboard the steamship Mongolian, when a foundering yacht is picked up by "wireless," and all her people, including, of course, the hero and heroine, in whom the audience is chiefly interested, are rescued in the face of a terrible storm.

The story of the play also involves the scene of tempering a great naval gun in the steel mills at Midvale, Pa., and this picture has been carried out with the utmost fidelity. As shown in one of the accompanying illustrations, taken from a photograph of a miniature model of the setting, a typical steel mill is depicted, complete with tempering furnaces, steam hammers, cranes, hoists, etc., and noisome to the last point of realism. Such incidental touches as the escape of a few wisps of steam around the piston of the steam hammer, indicating an imperfect packing, and the instant vaporization of the remainder of a cupful of water which a workman throws into a mass of scrap iron near the furnace, heighten the realization of an actual working furnace room. The latter incidental effect, it may be noted, is produced by the aid of an electric hot-plate mounted in the heap of iron. After taking a drink from the cup hung on a very customary bracket, the workman casually throws the remainder of the cupful against the hot-plate, from which it rises in a quick puff of white steam. The furnaces themselves shine with the incandescent glow of intense combustion, emitting slight traces of smoke. The furnace effect is produced with the aid of three arc lights centred on the furnace door, while an electric fan blows the smoke from smouldering saltpetre-soaked paper through the crevices about the gun. In the rear of the stage floor is supposed to be a vertical tempering furnace. At the blast of a whistle the immense, apparently white-hot gun, is lifted out of this pit, accompanied by the hissing of a steam blast, which envelops it in clouds of vapor, and the noise of a machine which imitates the sputtering sound of hot metal. The appearance of the gun at a white heat is admirably counterfeited by making it of oiled silk stretched on a cylindrical frame which encloses 104 sixteen-candlepower electric lamps throughout the length of the barrel. By proper painting the appearance of the hot barrel, graduating in temperature to the breech, is realistically shown by the transmitted light of the electric lamps. From the vertical furnace the white-hot gun is carried on a traveling crane to the oil pit, into which it is plunged with appropriate effects. In the illustration the gun is seen just being lifted out of the vertical furnace. A few minutes later the furnace at the left is opened and this great gun, similarly incandescent, is carried to the steam hammer, which delivers its effective blows. The appearance of the gun's cooling during the hammering process is secured by interposing a dimmer rheostat in the lamp-supply circuit. The bedlam of boiler-shop noises incidental to this scene is produced by a variety of special appliances, including boxes filled with iron strips, which are dropped distances of several feet, hammers and tanks, mallets, and a pneumatic hammer which derives its compressed-air supply from a motor-driven compressor outfit, also carried with the show.



STEEL WORKS SCENE IN THE PLAY "VIA WIRELESS."

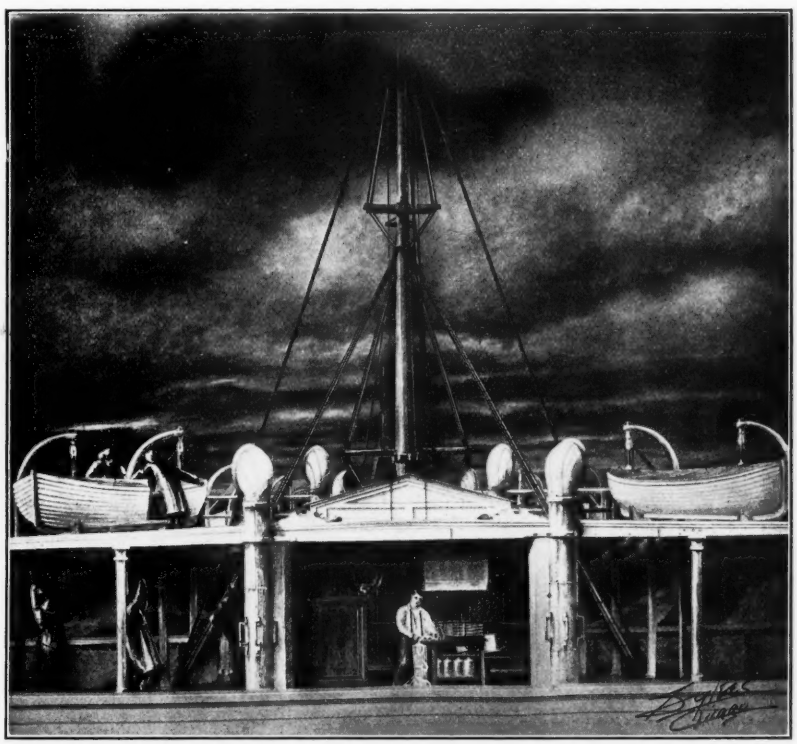
The chief interest in the play centres in the "wireless" scene, for which the stage setting is shown in the second illustration. This realistic cross-section of the vessel is made to pitch, roll and plunge most realistically; meanwhile the thunder crashes, the lightning flares and the waves stream past. This ship is an interesting piece of construction. It weighs about six tons and its motion is made possible by its support on a single ball-and-cup bearing, carried on a fifteen-ton jack supported directly on the building foundation. The movement of the vessel is produced by a number of stage hands who, unseen, hold to the lower works and rock the deck platform about the point of support.

The outline of this rocking platform is substantially a triangle, thirty-nine feet six inches on the audience base and twenty-five feet deep. The immense overhang of this structure, which, supported at a single central point, must carry several persons even at its extremities, is made possible by the manner of construction which makes structural members out of the mast and shrouds, the latter acting

as tension pieces to carry the overhang load to the mast, which is mounted directly over the point of support.

The wireless equipment comprises a Marconi 300-mile apparatus said to be the duplicate of that carried by the ill-fated steamer Republic. The progress of the scene is accompanied by sheet-lightning flashes from six arcs and streak lightning from one projector, while two "running-water" projectors and two "breaker" projectors are mounted on the bridges. The actuation of thunder sheets, thunder drums and an ear-splitting thunder-crash machine is directed from the stage manager's station through signal-lamp circuits. To enable the director to follow the lines of the play in spite of the deafening noise back of the stage, two microphone transmitters are mounted in front of the "wireless" operator's station in the ship's cabin and connected to head receivers worn by the stage director. From signal switches under his hand he operates the sheet lightning, calls for appropriate thunder and surf effects and transmits the cues for the actors. The dazzling discharge of the "wireless" spark-gap in the darkened auditorium makes a dramatic effect. Perhaps a criticism that can be made of the fidelity of the "wireless" outfit is the matter of receiving with a telegraph sounder, but which is probably the only course left to include the audience in the messages received. Interruption of any of the vital circuits employed in this scene is guarded against by the duplication of all lines and sources of current supply. Thus there are two telegraph-sounder circuits, two telephone bells, two power-supply sources and two signaling microphones.

To operate the boat scene fifty-three men are used, and in all thirty-two arc lamps are employed in these effects, with numerous border and strip lights. The steel house curtain and the air compressor are motor operated.



SHIP SCENE IN THE PLAY "VIA WIRELESS."

An induction-coil outfit similar to that in the ship scene supplies a spark-gap mounted on high-tension insulators on the theatre entrance canopy, and this with an attractive flasher sign showing a lightning streak, a red arrow and a double chaser border around the name of the playhouse, provides an attention-compelling display.

The thrill of the whole thing, outside of the remarkable stage fixtures, is the work of Joseph Kaufman, who impersonates the Marconi operator, maintaining an amazingly moving scene with cleverness and an example of fine physical endurance.

The play "Via Wireless," arranged and produced by Frederic Thompson, was written by Paul Armstrong and Winchell Smith, embodying the "wireless" scene from a one-act sketch by E. Balmer and I. W. Edwards. The scenery was built at the Luna Park shops under John F. Corrigan, superintendent, and the electrical effects built under Hugh S. Thomas, superintendent. The executive staff comprises: Robert M. Evans, manager; James Shugreen, business manager; Joseph Kaufman, stage manager; John F. Corrigan, master carpenter, and Addison Campbell, chief electrician.

Merchants' Association of New York

By a unanimous vote, the board of directors of the Merchants' Association of New York, at the meeting held on February 25, elected the following gentlemen as officers of the association for the ensuing year:

President—Henry R. Towne, president of Yale & Towne Manufacturing Company.

First Vice-President—Gustav H. Schwab, of the North German Lloyd Steamship Company.

Second Vice-President—William A. Marble, vice-president of R. & G. Corset Company.

Third Vice-President—Robert C. Ogden.

Treasurer—Gustav Vintschger, president Markt & Company, Ltd.

Secretary—S. C. Mead.

Counsel—Hon. John W. Griggs.

To fill a vacancy now existing in the board the directors elected Albert Plaut, of Lehn & Pink, who succeeds William J. Schieffelin, resigned.

The Chicago Electric Club.

At the midday meeting of the Chicago Electric Club, held on Wednesday, March 10, Homer Niesz delivered an address entitled "Central-station Publicity and Its Relation to the Industry." Mr. Niesz pointed out the great value to the central station and to the public of the large organizations which had been developed in recent years for carrying forward the publicity of semi-public corporations. The Commonwealth Edison Company was spending something like $150,000 a year in publicity, and this included the publishing of a monthly magazine, newspaper advertising, circular letters, trucks and automobiles, solicitors and demonstrations. The net returns to the company justified the expenditure, and as a result of the campaigns of publicity the growth of the connected load has been remarkable.

Single-Phase Railways of Europe.

The table below has been compiled by the Siemens Brothers Dynamo Works of England, and is believed to be a complete compilation of the single-phase railways of Europe. It includes not only those operating or under construction, but those for which construction contracts have been let. The total length is 591.4 kilometres or 567.25 miles.

Name of Line.	Line Voltage.	Frequency.	Length of Line in Km.	No of Electric Equipments. For Motor Coaches.	For Locomotives.	Motors. No.	H. P. per Motor.	Total H. P.	Date of Opening.
Murnau-Oberammergau...	6,000	16	26.0	4	2	10	100	1,000	Beginning of 1905
						2	175	350	Beginning of 1905
Swedish State Railway...	20,000	25	....	..	1	3	110	330	July, 1905
Vienna-Baden	550	15	65.0	19+1	..	80	60	4,800	May 1, 1907
						2	30	60	May 1, 1907
Blankenese-Hamburg-Ohlsdorf	6,600	25	65.0	6	..	13	175	2,275	January 29, 1908
Rotterdam-Hague-Scheveningen	10,000	25	76.5	25	..	54	175	9,450	October 1, 1908
Midland Railway.....	6,600	25	33.5	2	..	5	175	875	April 13, 1908
Seebach-Wettingen	15,000	15	21.5	..	1	6	225	1,350	December 1, 1907
Roma-Civita-Castellana...	6,000	25	....	4	..	20	40	800	December, 1906
	500								
Parma Provincial Rys...	4,000	25	60.0	10	..	24	60	1,440	In preparation
	400								
St. Pölten-Mariazell.....	6,600	25	106.0	..	13	28	250	7,000	Under construction.
Experimental locomotive.	10,000	15	....	..	1	2	500	1,000	In preparation
Wiesental Railway, Basel-Schopfheim	10,000	15	60.0	..	10	24	500	12,000	In preparation
Spiez-Frutigen	15,000	15	19.9	3	..	8	225	1,800	In preparation
Vacz-Budapest-Godöllö...	10,000	15	58.0	11	4	36	175	6,300	In preparation
Total (to end of 1908)		..	591.4	85	32	318	...	50,830	

Automatic Signal Recorder for Mines.

The *South African Mining Journal* describes a device for use in mines for automatically registering signals given in the shaft and in the engine room, as well as the travel of the skip or cage. The records are obtained by means of a specially constructed clock between the face of which and the works is fixed a cylinder about six inches in length by two inches in diameter. A paper band, sectioned into time spaces, is placed over the cylinder, and a small disc recorder with a separate needle attachment is adjusted in close proximity to one side of the cylinder. The disc and needle are both operated electrically but separately. The disc which records the skip journeys is brought into contact with the sectional paper on the cylinder by means of a small motor driven from the winding drum, marking a line on the traveling paper as long as the drum is in motion. When the drum ceases to revolve the contact is cut off automatically and the disc is raised from the paper, which continues to travel without being marked until the drum commences to revolve anew, when the process is repeated. The signal registrations are attained by means of a separate wire connected with the signal bell. Immediately a signal is given, the needle is simultaneously projected on to the traveling cylinder barrel and perforates the paper, the perforation being repeated each time the bell is rung. The time sectional paper thus records each and every signal given, and the times at which they occurred. The clock and registering apparatus is enclosed in a glass case which permits observations of the movements. A separate instrument is, of course, required for each engine. The machine need not necessarily be placed in the engine room, but in any place which may be convenient.

Minneapolis Street-Railway Bills.

Two measures, relating to the taxation and control of the street-railway systems of Minneapolis and St. Paul, are before the Legislature. The Johnson bill would place the Twin City Rapid Transit Company under a six per cent gross earnings' tax. The Nolan bill would put the company under supervision of the State Railroad and Warehouse Commission. The two bills named are of recent introduction, and they seem to have a fair chance of passing.

The Common Council of Minneapolis is considering the proposition to withdraw its suit against the Twin City Rapid Transit Company, that is now before the United States Supreme Court on appeal.

Loving-Cup Presented to T. Commerford Martin.

On the occasion of the anniversary dinner of the American Institute of Electrical Engineers, commemorating the twenty-fifth anniversary of the Institute, Frank J. Sprague, on behalf of the past-presidents of the Institute, presented to T. Commerford Martin a silver loving-cup. The abstract of Mr. Sprague's eulogy appears elsewhere in this issue. The cup bears on one side the following inscription:

To T. Commerford Martin, Senior Past-President of the American Institute of Electrical Engineers. Presented March 11, 1909, at the Quarter Centenary Celebration of the Founding of the Institute. In appreciation of twenty-five years of unselfish devotion to the best interests of the Institute and the advancement of the electric arts.

The other side of the cup bears the names of the donors, as follows: Edward Weston, Elihu Thomson, Alex. Graham Bell, Frank J. Sprague, Louis Duncan, Francis B. Crocker, Arthur E. Kennelly, Carl Hering, Charles P. Steinmetz, Charles F. Scott, Bion J. Arnold, John W. Lieb, Jr., Schuyler S. Wheeler, Samuel Sheldon, Henry Gordon Stott, Louis A. Ferguson, Past-Presidents of the American Institute of Electrical Engineers.

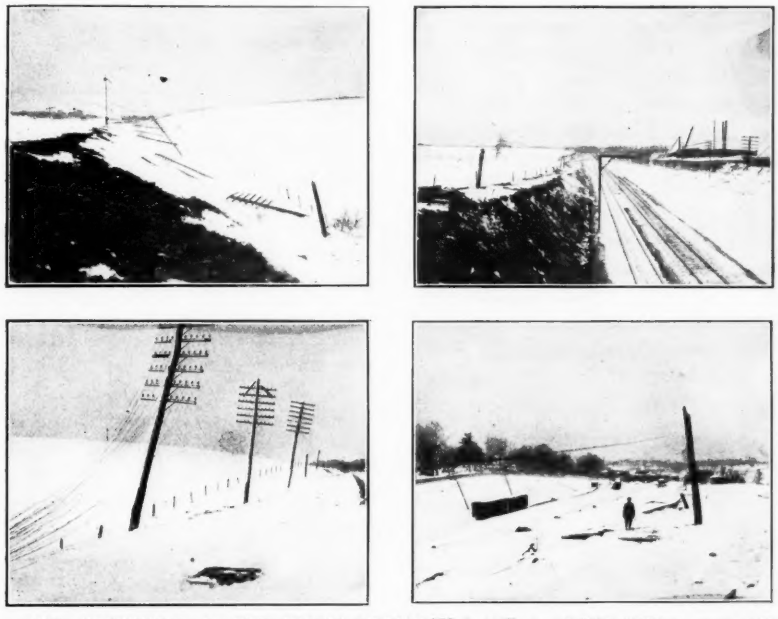
In presenting the cup, Mr. Sprague said: "Friend Martin, in asking you to accept this memento, permit me, in company with the past-presidents who are present, and as representing those whom circumstances have prevented being with us tonight, to drink a toast to your long life, health and happiness and the continued efficiency of your labors in behalf of our beloved Institute."

LOVING CUP PRESENTED TO T. COMMERFORD MARTIN.

Sleet-Storm Damage.

Although the weather during the present winter has been comparatively mild, there have been two or three severe storms which have taxed the ability of telephone and telegraph companies using overhead circuits to maintain service, and the loss occasioned has been very great.

Probably the most spectacular storm of the present year was that which visited the southern and eastern section of the country on the evening of March 3 and the morning of March 4. The effects of the storm were decidedly noticeable, for all the great daily papers of the country were eagerly awaiting news of the inauguration from Washington, and it seemed a peculiar coincidence that Washington appeared to be the storm centre, and the raging elements prostrated mile after mile of the pole lines of the telephone and telegraph companies.



SOME EVIDENCES OF THE STORM OF MARCH 3 AND 4, ALONG THE B. & O. BETWEEN WASHINGTON AND BALTIMORE.

At least 5,000 telegraph poles of the Western Union were broken off or blown down on Wednesday and Thursday, March 3 and 4, between Alexandria, Va., and the Susquehanna River. The Postal, though badly crippled, did not lose so many poles or so many miles of wire as the Western Union. In many places poles were badly damaged and wires so utterly destroyed and tangled that they were of practically no value except as junk. In many cases trees along the route were broken, crashing through the lines and carrying them down.

During the height of the storm the ice on the wires was from three to eight inches thick. Between Washington and Baltimore, in one section, 338 poles were down, 200 of them in the ten miles nearest Baltimore. The highways were almost impassable even Saturday and Sunday, the mud being knee-deep in places and the snow in big drifts. Out of 250 Western Union wires leading from Washington when the storm began, only two were left on Thursday morning, and these were southern wires. Over these messages

EVIDENCES OF THE STORM OF JANUARY 29, NEAR MARSHALLTOWN, IOWA.

were sent to New York, via Cincinnati. As soon as the storm abated, the Western Union had a thousand men at work, drawing this force from New York, Boston and as far west as Chicago. Telegraph poles were rushed on special trains from as far north as Boston. The difficulty of getting poles was one of the greatest tasks. By Sunday morning there were seven wires working into Baltimore from Philadelphia, and eighty-seven altogether working in Washington. At this time new wires were being added hour after hour.

An earlier storm on January 29 caused considerable damage, as some of the illustrations herewith indicate. These pictures were all taken in and around Marshalltown, Iowa, on the morning after the storm. Sleet began to fall about midnight on January 29, the wind rising to the force of a hurricane by early morning. Between 5 a. m. and 7:30 a. m. the damage shown in the pictures herewith was all done. The toll lines were put out of commission and the telegraph lines were laid flat for miles. The damage in this case was placed at over $10,000.

Denver Tramway Reorganization.

Stockholders of the Denver Tramway Company have approved the reorganization plan which has been under consideration for several months. It involves a new issue of $25,000,000 twenty-five-year, five per cent bonds which may be issued up to eighty-five per cent of the amount expended for improvements and extensions. It is reported that the directors contemplate calling for redemption at 105 on November 1, the $6,000,000 outstanding bonds of the Denver & Northwestern Railway, which comprises the suburban lines of the tramway system. Directors of the company declare that $5,000,000 will be immediately available for improvement and extension work.

Electrical Committee, Underwriters' National Electrical Association.

The seventeenth annual meeting of the Electrical Committee of the Underwriters' National Electric Association will be held on March 24 and 25, at the rooms of the New York Board of Fire Underwriters, 32 Nassau Street, New York. The first meeting will be called at 10 o'clock, Wednesday morning.

C. M. Goddard, secretary of the Electrical Committee, 141 Milk Street, Boston, Mass., has issued a bulletin containing the committee reports and the suggestion for changes in the National Electrical Code which will be considered at this meeting.

Illogical to Reduce Copper Production.

"How absurd to ask the old-established company which has invested millions of dollars underground and in its surface plant, to shorten its output in order to help out the large number of smaller high-cost producers," says an official of a big copper-producing company in a recent interview. "Our company has an investment of over $25,000,000 in copper properties. We can make copper for a little over eight cents per pound. As directors we would be false to our responsibilities to our stockholders if we consented to reduce our output and our earnings in order to assist a competing concern which cannot make copper for less than twelve or thirteen cents per pound. As a business proposition it is illogical.

"Any such curtailment movement, to be effective, must necessarily have the signatures of the foreign copper producers, for it would be suicidal for the American mines alone to advance prices through reduced output and thus fatten up the price for foreign competitors. Copper has a world market, is duty free, and the price on one side of the water is the price, freight added, on the other side.

"Any agreement among the copper producers to reduce the output would at once hold these companies liable to prosecution by the courts on the ground that an attempt was made to restrict trade in contravention of the Sherman anti-trust law. Such a procedure, if within the letter and spirit of the law, would also be impractical in its operation unless it included internationally all or substantially all the big producing interests."

Supply of Copper Increased.

The general expectation in the trade of large increases in the stock of marketable copper in the United States during February was borne out in the figures made public by the Copper Producers' Association on March 10, which showed a gain of 29,154,203 pounds during February. This increase in stocks compares with a gain of 21,772,779 pounds in January.

The following is the report of the association:

	Pounds.
Stock of marketable copper of all kinds on hand at all points in the United States Feb. 1, 1909	144,130,045
Production of marketable copper in the United States from all domestic and foreign sources during February, 1909	103,700,817
Deliveries of marketable copper for consumption and export during February, 1909	74,546,614
Stock of marketable copper of all kinds on hand at all points in the United States, March 1, 1909	173,284,248

FINANCIAL REPORTS OF ELECTRICAL COMPANIES.

BOSTON SUBURBAN ELECTRIC.

The February gross earnings of the Boston Suburban Electric Company, excluding the operations of its Waltham Gas and Electric property, increased fractionally over three per cent. Since the first of the current fiscal year, beginning October 1, the earnings of the Boston Suburban street-railway lines have shown an increase of about four per cent over a year ago, while net earnings have increased over sixty-five per cent. Present earnings, after charges, are at the rate of over five per cent per annum on the preferred shares, and it is probable that the three per cent dividend rate will be increased to four per cent this fall.

Accrued dividends on the preferred shares now amount to $429,667, but the sale of the Waltham Gas Company for about $800,000 will provide a substantial surplus available for back dividends.

With a reduction in its property account, the trustees will also take action for a reduction in the outstanding capitalization.

It is probable that about 6,000 preferred shares will be retired. Their cancellation will bring the capitalization down to a point where the earnings of the street-railway lines should easily permit an early increase in the dividend rate to four per cent and place the common stock in sight of dividends. There are 50,219 preferred shares.

AMERICAN GAS AND ELECTRIC.

The American Gas and Electric Company reports for the month of January and three months ended January 31, 1909, compared as follows:

January:	1909.	1908.
Gross earnings (oper. cos.)	$229,211	$190,465
Expenses, taxes, charges, etc.	157,318	142,008
Net earnings (oper. cos.)	$ 71,893	$ 48,457
Net A. G. & E. Co.	4,791	4,245
Total net income	$ 76,684	$ 52,702
Interest on col. trust bonds	26,175	26,175
Surplus	$ 50,509	$ 26,527
Preferred dividends	7,631	6,820
Net surplus	$ 42,878	$ 19,807
November 1 to January 31:		
Gross earnings (oper. cos.)	$681,371	$558,337
Expenses, taxes, charges, etc.	477,453	405,237
Net earnings (oper. cos)	$203,918	$153,100
Debit A. G. & E. Co.	12,818	11,228
Total net income	$191,100	$141,872
Interest on col. trust bonds	78,525	78,525
Surplus	$112,575	$ 63,347
Preferred dividend	22,950	20,160
Net surplus	$ 89,625	$ 43,187

KANSAS CITY RAILWAY AND LIGHT.

The report of the Kansas City Railway and Light Company for the month of Jan-

uary and eight months ended January 31 compares as follows:

	1909.	1908.
January gross	$ 534,527	$ 496,321
Expenses	315,497	258,831
January net	$ 219,030	$ 237,490
Charges and taxes	152,801	151,278
January surplus	$ 66,228	$ 86,212
Eight months gross	4,343,306	4,175,059
Expenses	2,466,916	2,140,245
Eight months net	$1,876,390	$2,034,814
Charges and taxes	1,240,142	1,228,021
Eight months surplus	$ 636,248	$ 806,793

CROSSTOWN STREET RAILWAY.

The report of the Crosstown Street Railway Company of Buffalo for the quarter ended December 31, 1908, compares as follows:

	1908.	1907.
Total railway oper. revenue	$195,598	$170,007
Total railway oper. expenses	126,103	108,028
Net railway oper. revenue	$ 69,494	$ 61,979
Taxes accrued	13,421	12,397
Operating income	$ 56,072	$ 49,581
Total deduction gross income	37,175	37,175
Net corporate income	$ 18,897	$ 12,406

INTERNATIONAL RAILWAY.

The report of the International Railway Company (Buffalo) for the quarter ended December 31, 1908, compares as follows:

	1908.	1907.
Total railway operating rev.	$1,084,778	$1,128,063
Total railway operating exp.	757,289	734,312
Net railway operating rev.	$ 327,489	$ 393,750
Taxes accrued	60,172	61,386
Operating income	$ 267,316	$ 332,364
Other income	7,033	7,176
Gross income	$ 274,350	$ 339,540
Total deductions from gross income	231,908	239,926
Net corporate income	$ 42,442	$ 99,613

WESTERN UNION.

The Western Union Telegraph Company has issued its preliminary estimated statement of earnings for the quarter ending March 31, 1909. This compares with actual figures for the same period of 1908 as follows:

	*1909.	1908.
Net revenue	$1,700,000	$1,330,886
Bond interest	433,062	433,062
Balance	$1,266,938	$ 897,824
Dividends	747,160	1,230,100
Surplus	$ 519,778	†$ 332,276
Previous surplus	16,077,905	14,077,080
Total surplus	$16,597,683	$13,744,804

*Estimated. †Deficit.

The actual figures for the December 31, 1908, quarter compare as follows:

	1908.	1907.
Net revenue	$1,930,064	$ 803,942
Bond interest	433,063	433,062
Balance	$1,497,002	$ 370,886
Dividends	747,025	1,217,000
Surplus	$ 749,976	*$ 846,120
Previous surplus	15,327,929	14,923,200
Total surplus	$16,077,905	$14,077,080

*Deficit.

The earnings (actual to December 31) for the nine months ending March 31, 1909, compare with the corresponding period of former years as follows:

	1909.	1908.
Net revenue	$5,495,019	$1,723,333
Bond interest	1,299,187	1,299,186
Balance	$4,195,832	$ 424,147
Dividends	1,992,005	3,664,150
Surplus	$2,203,827	*$3,240,013
Previous surplus	14,393,857	16,884,781
Total surplus	$16,597,682	$13,644,768

*Deficit.

President R. C. Clowry, of the Western Union, in his report, says:

"The telegraphic business outlook is improving. The property of the company is being maintained in good condition, and additional facilities provided as required. The quarterly report shows net earnings of one-and-one-fourth per cent—receipts for the month of March being estimated—for the quarter ending March 31, 1909."

WEST INDIA ELECTRIC.

The West India Electric Company of Jamaica has issued its annual report for the year ended December 31, 1908. The income account compares as follows:

	1908.	1907.
Gross	$217,410	$198,845
Expenses	92,040	94,805
Net	$125,370	$104,040
Bond interest	30,000	30,000
Taxes	7,044	6,953
Rentals	12,000	10,000
Total deductions	$ 49,044	$ 46,953
Surplus	76,326	57,087

WESTERN TELEPHONE AND TELEGRAPH.

The Western Telephone and Telegraph Company issued its report for the year ended January 31, 1909. This shows as follows:

	1909.	1908.
Interest	$ 641,447	$ 668,109
Dividends	1,578,798	1,456,305
Miscellaneous	4,921	.....
Total net receipts	$2,225,166	$2,124,414
Interest and discounts	1,372,250	1,287,451
General expenses	23,506	29,100
Total expenses	$1,395,756	$1,316,551
Net revenue	829,409	807,862
Dividends	800,000	800,000
Surplus	$ 29,409	$ 7,862

The total number of exchanges operated by the company at the end of 1908 was 413. The stations operated through these exchanges numbered 277,227, an increase during the year of 15,265. To this number are to be added 204,594 stations of 1,141 companies which operate under contract in small towns and rural districts in connection with the company, making a total of 481,821 stations, as compared with 344,541 at the close of the previous year.

The mileage of exchange wire owned and operated at the end of 1908 was 714,391 miles, an increase of 90,578 miles. Mileage of toll-line wire, 140,473 miles.

The expenditure for new property during the year has been: For exchange construction, $1,000,500; for toll-line construction, $119,000; for real estate and buildings, $117,100; for other property acquired, $71,800; a total of $1,308,400.

TWIN CITY RAPID TRANSIT COMPANY.

The Twin City Rapid Transit Company has issued its full pamphlet report for the year ended December 31, 1908. The income account compares as follows:

	1908.	1907.
Gross	$6,399,509	$6,055,742
Expenses	3,166,055	2,980,435
Net	$3,233,454	$3,075,307
Interest and taxes	1,359,363	1,223,170
Surplus	*$1,874,091	$1,852,137
Dividends	1,215,000	1,215,000
Surplus	$ 659,091	$ 637,137
Ap. from renewals	544,000	506,000
Surplus	$ 115,091	$ 131,137

*After allowing for 7 per cent preferred dividends, the balance, $1,664,091, equals 8.27 per cent earned on the $20,100,000 common stock.

The earnings and expenses, in detail, compare as follows: Gross earnings:

	1908.	1907.
Passenger	$6,333,296	$6,020,541
Miscellaneous	66,213	35,201
Total	$6,399,509	$6,055,742

Operating expenses:

Maint. way and supplies	$ 205,624	$ 192,209
Maintenance equipment	291,051	269,748
Power plant	516,418	513,866
Car service	1,480,495	1,340,962
General expenses	388,693	412,518
Injury and damages	235,774	203,131
Insurance	48,000	48,000
Total	$3,166,055	$2,980,435

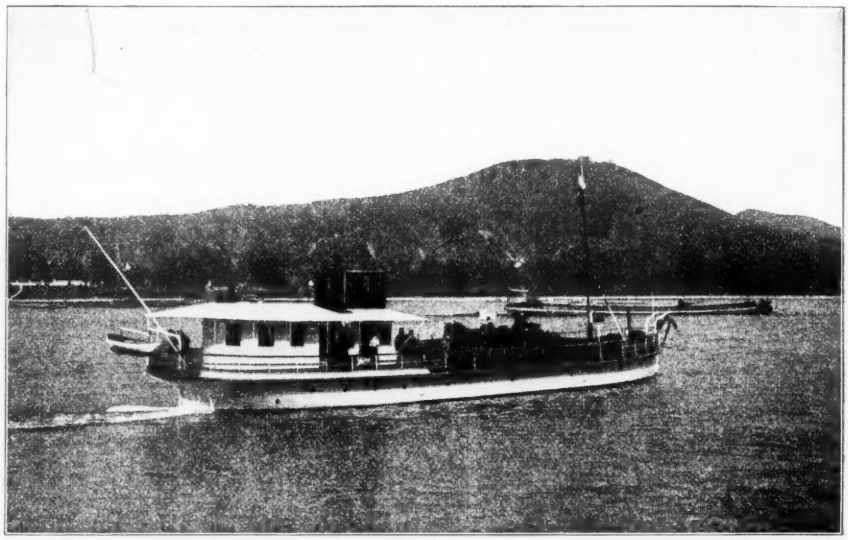
Considering the business depression that was experienced during the year, the results attained may reasonably be regarded as gratifying, and would seem fairly to indicate what might be expected under favorable business conditions. A review of the comparative statement of expenses shows that the larger surplus from operation has not been secured at the expense of adequate maintenance. These expenses have, in fact, been increased by $34,718, and the property of the company maintained at a high standard of efficiency. The service afforded the public has been extended and improved, and the car mileage increased 7.41 per cent.

In addition to the maintenance charges of $496,675, renewals have been made during the year and charged to the renewal fund to the amount of $256,006. The direct appropriation to the fund for the year was $544,000, and interest to the amount of $29,800 was further added to it, an increase of $50,300 on the appropriation of the previous year. The renewal fund now amounts to $1,173,713, of which $1,173,500 is invested in the five-per-cent bonds of the company. The policy of setting aside funds to provide for renewals was inaugurated in 1904.

REVIEWS OF CURRENT ENGINEERING AND SCIENTIFIC LITERATURE

AN ELECTRIC FERRYBOAT ON THE RHINE

An electric ferryboat has recently been put in service between the towns of Godesberg and Niederdollendorf, situated on the left and right banks of the Rhine. Electrical propelling was adopted in view of the many advantages it possesses, as the absence of smoke, noiseless running of the machinery, saving in weight, room, coal, oil and labor, the absence of vibration and consequent longer life of the vessel, easy regulation and reversal of the propellers and direct control of the motors from the pilot house. The vessel is provided with two propellers and has an overhanging platform, so as to be able to accommodate the largest vehicles. It is thirty metres long and its greatest width is eight metres. The draught of the completely equipped vessel is 0.85 metre, and it has an official carrying capacity of 645 persons. The hull of the vessel, which is made of Siemens-Martin steel, is divided into a collision bulkhead, the crew's cabin, accumulator room, machine room and the peak. The deck contains the anchor hoists, the mast, platform for vehicles, passenger cabin and pilot house. Below the latter are the captain's quarters and toilet rooms. The accumulator battery, which is installed below the platform, consists of 160 elements in hard-rubber cases, each ten elements being contained in a wooden trough. Its capacity is 335 ampere-hours at a one-hour discharge under an average tension of 290 to 300 volts. The maximum charging current may be 162 amperes, and the charging tension at the battery poles varies from 320 to 440 volts. The accumulator room also contains two three-horsepower motors for operating the gangplanks. The room behind the accumulator room contains the propeller motors, the main switchboard and an electrically driven water pump. Each propeller is driven by a direct-current motor furnishing fifty horsepower at 300 volts and 300 revolutions per minute. The motors are of the marine type and have, besides the main winding, also reversing poles, which make it possible to regulate them within the widest limits and effect a sudden reversal without any sparking at the commutator. The motors are started and regulated from the pilot house, and they may be made to run independently forward or backward, or both together forward or backward. The machine room also contains the switchboard with all the measuring instruments, switches for motors and lighting installation and safety devices. The vessel was built by the firm of Berninghouse, in Duisburg, and the electrical equipment was furnished by the Felten & Guilleaume-Lahmeyer Company, of Frankfort.—*Abstracted and translated from Elektrotechnische Zeitschrift (Berlin), February 18.*



AN ELECTRIC FERRYBOAT ON THE RHINE.

IMPROVEMENTS IN ELECTROPLATING.

The production of galvanic coatings on metal is divided into two phases, the cleaning or fat-removing process and the depositing process. The cleaning requires a great deal of work and care. It may be done electrolytically by using the objects to be cleaned as cathodes in a cleaning bath, in which insoluble anodes are employed. Alfred Levy of Paris proposes a method which makes it possible to apply both processes, cleaning and depositing, simultaneously, no matter what kind of metal or alloy is to be deposited, whether it be silver, tin, zinc, nickel, etc. In this method an anode of the same metal or alloy that is to be deposited, is employed, the objects to be covered forming the cathode, in a bath composed of a concentrated solution of some alkaline substance (soda, potash, etc.) with a slight addition of some alkaline cyanide. This addition may vary according to the nature of the metal to be deposited and the thickness of the coating desired. Excellent results have been obtained by the use of a quantity of cyanide equal to one-tenth of the amount of alkaline salt used. Chlorides and iodides may also be added in place of the cyanides, but in this case suitable solvents, as alkaline sulphites or alkaline hyposulphites, must be used in the electrolyte. The passage of current through such an electrolyte first causes the complete removal of all grease from the objects serving as cathode, and at the same time it produces on them, by attacking the anodes, the electrolyte necessary for the formation of the subsequent metallic deposit. Therefore current must flow through the bath for some time before perfectly satisfactory deposits are produced. But the result may also be obtained immediately by replacing the alkaline cyanide from the beginning, partly or entirely, by the corresponding metallic cyanide. By the new process the cleaning and electroplating of

objects can be accomplished successively in one and the same bath, thus saving a double operation. Furthermore, by the use of the metallic anodes, the metallic salts necessary for producing the deposit are formed in the bath itself, and the employment of these often expensive salts for the preparation of the electrolytes is avoided.—*Abstracted and translated from Elektrotechnischer Anzeiger (Berlin), February 7.*

SINGLE-PHASE TRACTION ON THE SWEDISH STATE RAILWAYS.

The high price of coal in Sweden brought about the determination several years ago to electrify all the main railway lines. A thorough investigation was made of all systems of electric traction. Two short lines near Stockholm were experimentally equipped for single-phase working. An exhaustive report on their results and on the general problem has been completed by the engineer in charge of the investigation. A calculation of the necessary distributing network for all the Swedish lines on the three-phase and single-phase systems showed a saving in favor of the latter of some $10,000,000 after allowing for increased cost of power stations and locomotives. Therefore the single-phase system was regarded as the preferable one to experiment with to see whether the disadvantages of the single-phase motor were very great. Details of the tests are given. The frequencies used were fifteen, twenty and twenty-five cycles per second and the voltages on the line 3,000, 5,000, 6,000, 7,500, 12,000, 15,000, 18,000 and 20,000. Different parts of the line were equipped with direct suspension and single and double catenary overhead construction. The test results showed that it was perfectly feasible to employ the high voltages on the trolley system and that protective apparatus was so complete as to make the danger to passengers and staff no more than with ordinary voltages. From the experience with the various constructions an improved and simple trolley and feed-wire suspension was designed particularly suitable to the conditions met on the Swedish railways. The effect of the traction current on telegraph and telephone lines was studied in detail and regarded as not being a serious difficulty, either technically or financially. Early disadvantages of the single-phase motors have been rendered insignificant in later designs. In practically every way these motors are nearly as servicable and efficient as the direct-current motor. The author regards twenty-five cycles as the best frequency to use, when all things are considered. In conclusion he believes that the electric problem for the Swedish railways is solved, for, while there will doubtless be changes in details, it seems hardly possible that a simpler, better and cheaper system than the single-phase system can be obtained in the near future.—*Abstracted from the Electrician (London), March 5, 1909.*

ELECTRIFICATION OF RAILWAYS.

This is a paper read before the Rugby Engineering Society on February 18, by F. W. Carter, of the British Thomson-Houston Company. The author compares the advantages and disadvantages of the various systems of electrical operation to show that no single system seems to satisfy all classes of railway service, and he describes the classes of work to which each particular system is best suited. Whatever system of electrification is adopted, a large outlay of capital has to be provided, and in no case can electrification be regarded as practicable unless an increase in net receipts can be secured sufficient to more than pay interest on the extra capital involved. This increase may be brought about either by decreasing operating costs for the same service, or by increasing or bettering the service, so as to bring about an increased revenue, or by a combination of these. The author showed a number of speed-time curves in which equipments are compared having different rates of acceleration. From these he deduced the fact that the advantage of the higher rate of acceleration may disappear if the weight of the equipment is thereby increased considerably. In certain classes of service, such as urban transportation with frequent stops, high rate of acceleration is essential. For such service the single-phase system he regards as entirely unsuitable, since high acceleration can be attained by it only at a seemingly ruinous cost. The direct-current system is particularly adapted for frequent urban and suburban service. For interurban service, in which the trains and stops are somewhat infrequent, a high rate of acceleration is not so important, since the maximum speed is the determining factor. With few trains in comparison with the mileage of the road the installation of substations for direct-current operation would result in a very low load factor and a rather high initial cost. For such a service, therefore, it is desirable to feed as great a mileage as possible from each substation, and this is feasible only where a high-voltage single-phase system is employed. For through-train service at high speed, the train resistance is a large factor, and a larger part of the energy expended is used in overcoming it. High rate of acceleration is not required of the traction equipment in this case. The author seems to regard the polyphase system as well adapted for this service, but it has the disadvantages of not permitting multiple-unit operation and requiring at least two overhead trolleys. Electrical operation, as compared with steam, shows to greatest advantage in urban and interurban service. It is only where traffic is very dense, and frequent trains can be employed, that any great advantage in electrification of trunk lines can be expected. In the case of newly constructed railways that can be designed directly for electrical operation, the capital outlay would be less than that required for existing lines. Steeper grades could be permitted, so that the cost of roadbed would be less, this being sufficient in many cases to more than cover the greater capital cost of electrical motive power. For new railways electrical operation would be feasible in many cases, therefore, even in England, where there is little waterpower and much coal.—*Abstracted from the Electrical Engineer (London), February 26, 1909.*

Wireless 3,000 Miles.

Contracts were let on March 9 by the Government for the construction of what is expected to be, when completed, the most powerful wireless station in the world. It will be erected at Washington, D. C., and when in working order it will be able to communicate with naval vessels 3,000 miles away. A Pittsburg concern will do the work, which is to cost $182,600, including the erection of a tower in Washington and the equipping of one or two naval vessels.

The tower is to be 600 feet high, and it will be fitted with instruments so powerful that when they are searching out the vessels with which they are attuned no commercial wireless stations will be able to interfere.

The vessels to be equipped are to be able to communicate with the Washington station over 1,000 miles of sea and land or the contractors lose their pay. Each vessel is to have, also, a wireless-telephone apparatus with a communicating radius of 100 miles.

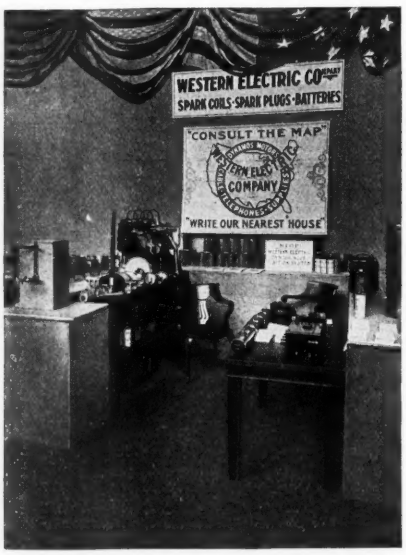
INDUSTRIAL SECTION

ILLUSTRATED DESCRIPTIONS OF NEW AND STANDARD ELECTRICAL AND MECHANICAL APPARATUS

A New Automobile Ignition System.

A very late development in ignition systems was displayed at the Motor Boat Show, at Madison Square Garden, New York city, by the Western Electric Company, whose exhibit is shown in the accompanying photograph.

This apparatus, known as the synchronous ignition system, embodies several new features, and its operation attracted no little attention during the show, where it was run in connection with a Speedway engine, manufactured by the Gas Engine and Power Company, Morris Heights, N. Y.



WESTERN ELECTRIC COMPANY EXHIBIT AT THE MOTOR-BOAT SHOW, MADISON SQUARE GARDEN, NEW YORK CITY.

In this system, which may be applied both to motor boats and automobiles, only one vibrator is used in connection with any number of non-vibrating coils. Two vibrators are provided, however, one being adjusted to give a heavy spark for starting with a cold engine; the other for use when the engine is warmed up and running. This greatly reduces the battery consumption, making the system economical.

The change from one vibrator to another can be made by shifting a small switch, which protrudes from the vibrator box. A pole-changing switch is also provided, which is so arranged that every time the batteries are switched off and on again, the direction of the current through the contact points is reversed. This feature eliminates the pitting which occurs at the platinum points in the ordinary vibrator. The non-vibrating coils are in a cylindrical, heat-resisting, insulated tube, which is mounted directly over the engine cylinders. This construction does away with the long high-tension leads so common in ignition systems, the secondary leads in this case being only about six inches in length, thus eliminating any danger of leakage from the high-tension leads to the engine frame. The vibrators used are of a special design, which insures smooth and rapid vibration; in fact, this vibrator makes 965 vibrations per second, marking it as perhaps the most rapid on the market.

The entire system is provided with a lock switch, the key of which can only be removed when the battery is off. This system can be used successfully with any engine of three, four, six or more cylinders.

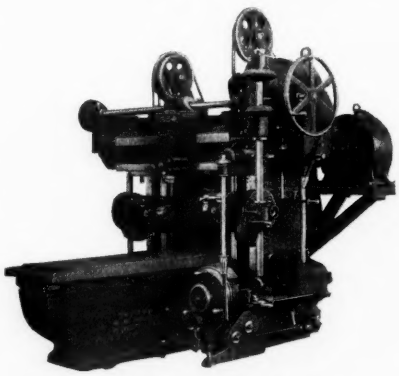
The Western Electric Company also showed a full line of spark coils of both the motor-boat and automobile types, electric batteries and fire extinguishers. Both Marten and Accurate fire extinguishers were shown, and the batteries included the Special 1900, Rapid Fire, the Acme, and the Hawthorne dry batteries, and Vivax storage batteries.

A Motor-Driven Three-Head Milling Machine.

The special operations involved in the manufacture of various products have led to the devising of new machines and the modification of existing machines to meet the new needs. The phenomenal growth of automobile manufacturing in recent years and the large number of special parts in this line to be machined have given rise to the production of the milling machine shown in the accompanying illustration.

This tool is designated by the manufacturers, the Ingersoll Milling Machine Company, as the automobile-type milling machine, and is made particularly for milling engine bases and transmission cases of automobiles. It is, however, not only adapted for this work, but for any other work which may be machined on either a planer or milling machine. The three spindles have speeds varying from fifteen to 120 revolutions per minute. The speeds are arranged for face mills up to ten inches in diameter for steel or cast-iron, but for aluminum work larger cutters may be used. The machine has a capacity of twenty-six inches between the ends of the horizontal spindles, and twenty-four inches between the table and vertical spindle.

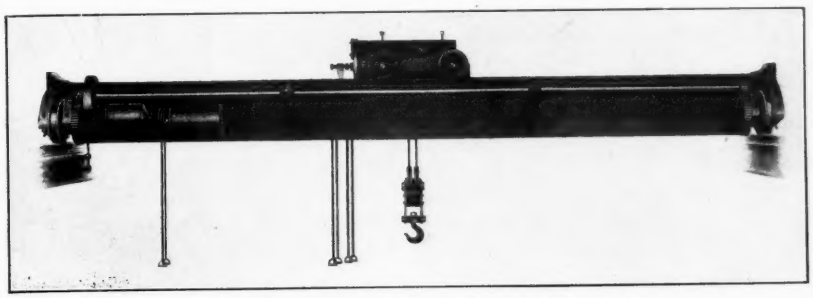
The motor equipment consists of a fifteen-horsepower, direct-current, shunt-wound, Westinghouse Type S motor. The motor is mounted on a bracket in the rear of the machine, where it takes up little space and does not interfere with the work or the operator. The speed changes, from 875 to 1,500 revolutions per minute, are effected by variations in the shunt field by means of a Westinghouse drum-type controller not shown in the illustration. In addition to the range of speed thus obtained, there are four changes by mechanical means. This enables the cutting speed required by the work to be obtained with exactness and maintained with certainty. In the case of machine tools especially is it desirable to have a perfect control and adjustment of the speed; and undoubtedly the most satisfactory method of obtaining this is by means of the adjustable-speed motor and a suitable controller.



MOTOR-DRIVEN THREE-HEAD MILLING MACHINE.

Northern Floor-Controlled Electric Traveling Crane.

In the case of electric cranes for intermittent, light service, the necessity of having an operator mount into the controller cab each time some operation is to be performed, often proves inconvenient and consumptive of the time of the men on the floor, of whose number the crane operator generally is, if the force be small. The control of such a crane directly from the floor may enable a limited crew of men or often a single man



NORTHERN FLOOR-CONTROLLED ELECTRIC TRAVELING CRANE.

to handle the work otherwise requiring two or a greater number.

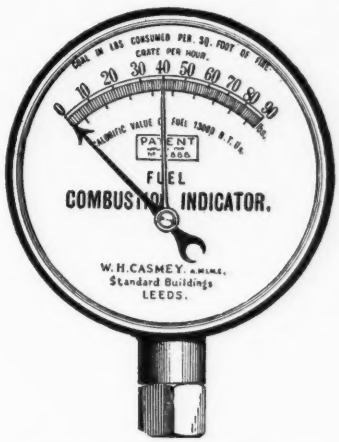
Illustrated on this page is a small floor-controlled electric traveling crane built by the Northern Engineering Works, Detroit, Mich. This crane, which can be furnished in either the one, two or three-motor design, is adapted to loads of from one to five tons, and spans ranging from twelve to forty feet. It consists of a double-girder bridge upon which rests a trolley, supporting an electric hoist of a type furnished by the makers. Any standard motor will be furnished, however, for either direct or alternating current.

The trolley is so arranged that it may be operated in either high, medium or low positions, thus adapting it to any height ceiling or any established distance from rail to truss chord. The hoist is equipped with both mechanical and electric brakes, and has an automatic limit stop for the block to prevent overwinding. The mechanical brake not only assists in holding the load, but effectually controls the lowering operation as well. The automatic limit stop is operated by positive contact and does not depend on the hoisting ropes for its operation. The hoisting gearing is of the spur-geared type, no bevel worm or planetary gearing being included in the crane. It is entirely enclosed in an oil-tight case.

The controllers have ample resistance for giving a wide range of speed, thus making the crane well suited to delicate handling, such as is necessary over foundry floors, and in riveting work, etc. While it is regularly furnished to be controlled from the floor by ropes or levers, it can be arranged, if desired, to be controlled either from a cab attached to the bridge, or from a fixed operating stand on the floor.

An Indicator Showing the Rate of Fuel Combustion.

It is well known that the most economical method of burning fuel is to supply no more air than is required for combustion, and that any excess of air above this means a loss equivalent to the value of the heat required to raise the temperature of this excess to that of the waste gases escaping up the chimney. Practical consideration renders it desirable to have a slight excess of air, the quantity being such that the carbon dioxide in the flue gases shall not fall below about 12.5 per cent. If the coal is fed on to the grates at a uniform rate, an indicator or gauge actuated by the draught will always point to the same place for a given weight of consumption per square foot of grate surface.



FUEL COMBUSTION INDICATOR.

An instrument recently described in the *Mechanical Engineer*, of Manchester, England, has been devised by W. H. Casmey of Leeds to afford a simple means by which the proportionate weights of air and coal necessary for complete combustion can be readily indicated.

The Casmey fuel-combustion indicator consists of a gauge actuated by the draught of the chimney, and has a scale graduated with readings giving the pounds of coal burned per square foot of grate area per hour. The points on the scale have been obtained from exhaustive experiments by noting the weights of coal burned per hour with varying air supplies, and with the CO_2 recorder indicating the desired percentages. A loose pointer is attached to the gauge which can be moved on the face of the dial opposite the figure, giving the weights of coal it is desired to burn per square foot of grate per hour, and the attendant adjusts his dampers to keep the draught-actuated indicator opposite this point. The indicator is a mechanical device and no chemicals are used in connection with it as in the ordinary CO_2 recorders.

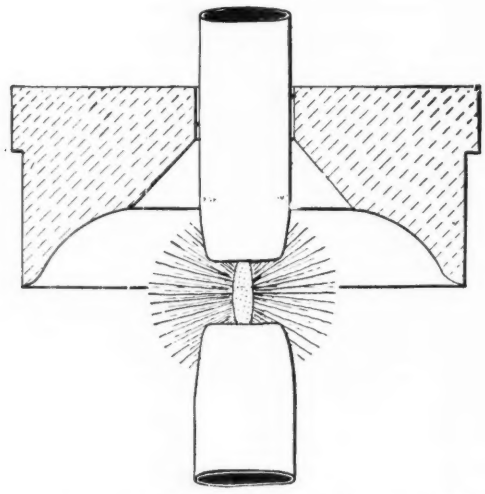
When desired the combustion indicator is fitted with a small dry battery and bell and the two pointers are the terminals of the circuit, and if the draught-indicated pointer deviates from the desired position the electric circuit is completed and rings the bell, thus calling attention to the fires, or to some change in atmospheric pressure which has affected them. The attendant should indicate on the red pointer, with which the dial is fitted, how much coal it is desired to burn per square foot of grate per hour. When the pointers are opposite each other no black smoke should be made.

Mr. Casmey based his calculations for the figures given on the dial on fuel with a calorific value of 13,000 British thermal units. Should fuel either richer or poorer in heat units be used, it is only necessary to move the indicator or pointer proportionately. As an illustration, if the fuel used contained only 12,000 British thermal units, or 8.3 per cent lower than the quality indicated on the indicator, and if it were intended to burn forty pounds per square foot of grate per hour, the indicator pointer instead of being placed at the figure forty on the dial would stand at thirty-six, or if the fuel contained 14,000 British thermal units the indicator pointer would be placed seven per cent further forward, *i. e.*, at forty-three on the dial.

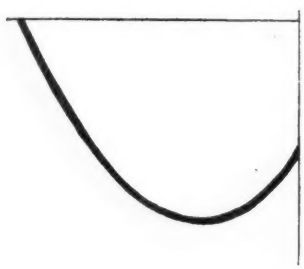
FLAME-ARC CARBONS.

BY K. ODWALD.

Compared with the ordinary carbon electrodes used in the older forms of open and enclosed arc lamps, flame-arc electrodes are of greater length and smaller diameter and produce, under proper conditions, an intensely luminous arc.



POSITION OF ELECTRODES IN "ALBA" LAMP.



LIGHT DISTRIBUTION WITH "ALBA" LAMP.

Usually the light-giving ingredients are placed in the carbon in the form of a core, and care must be taken to use only such core constituents as will decompose into the smallest particles, which will move along the arc and will be brought to intense incandescence. It is well known that the greater portion of the light with a flame-arc comes from the arc itself, while with the ordinary carbon electrodes the light comes from the incandescent crater, this being considerably less efficient than the highly luminous chemical arc.

The exact proportion and nature of the mixture in the core of a flame-arc electrode is, of course, a factory secret. For the yellow light, however, a compound of calcium is generally used, while for the white light the material is composed principally of rare earths, such as thoria or yttria, similar to those used in impregnating the Welsbach gas mantle. These substances are pulverized and mixed with carbon and a silicate binder, and filled in under pressure in a channel in the carbon electrode.

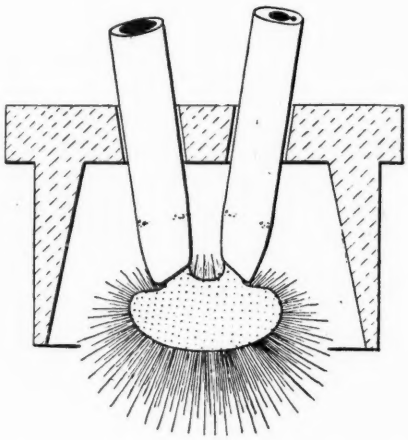
In direct-current operation it is advantageous to use a negative electrode without the chemical core, the arc in this case burning more steadily. In alternating-current operation both electrodes are alike, and in this case each electrode is fitted with the chemical core.

The necessity for securing long burning has made it expedient to use long thin electrodes, and where these have been placed co-axially the body of the lamp has been increased in length out of symmetrical proportions. One way out of this difficulty has been the placing of the electrodes in an inclined position side by side, and this departure in construction has introduced the use of blow-out magnets, a sliding negative guide plate, and an economizer and reflector.

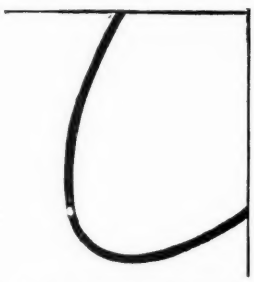
The magnet keeps the arc from traveling upward along the carbon and also prevents, to a considerable degree, any wandering of the arc. The economizer tends to concentrate the heat of the arc at the electrode centres, eliminates disturbing arc currents, and at the same time acts as a very effective reflector. The sliding guide adjusts the electrode to compensate for slight differences in structure and also takes care of the unavoidable fluctuations in the voltage supply.

Two of the successful arc lamps, recently developed for both co-axial arrangement and for inclined electrodes, are the "Aurola" and "Alba" lamps, which have been placed on the market by the Charles L. Kiewert Company, 114 Huron Street, Milwaukee, Wis. The "Aurola" lamp is equipped with inclined carbons and the "Alba" with vertical carbons. The distribution of light from these lamps is shown in the accompanying illustrations. The characteristic of the "Aurola" lamp is intense downward distribution, while the "Alba" lamp distributes the illumination over a greater area.

One of the mechanical features which make for the success of the chemical-core electrodes is the method used in introducing a conductor of low resistance, which reduces the current consumption and assures steady burning at the tip of the electrode. The method used with the Kiewert carbons allows the core material to enter the side recess and presses the wire to the carbon, insuring a good contact. This method is much to be preferred over that of copper plating the carbon, or running a strip of wire alongside the electrode.



POSITION OF ELECTRODES IN "AUROLA" LAMP.



LIGHT DISTRIBUTION WITH "AUROLA" LAMP.

GENERAL ELECTRIC COMPANY'S DATA ON TUNGSTEN LAMPS.

On the subject of tungsten lamps General Electric bulletin No. 4646 presents interesting data relative to the quality of light produced, simplicity of construction of the lamp, its adaptability to both alternating and direct-current circuits, and various other data relative to its life and economy. The application of the tungsten lamp to series street lighting is shown in bulletin No. 4647, which contains curves showing candlepower distribution of the lamp under different conditions.

A New Magneto-Telephone Set.

The Western Electric magneto-telephone set shown in the illustrations marks a departure in several respects from what has heretofore been offered in this line.

The changes introduced have resulted in making the set as a whole more efficient, the different parts more accessible for inspection and maintenance, and the outward appearance of the set more attractive.

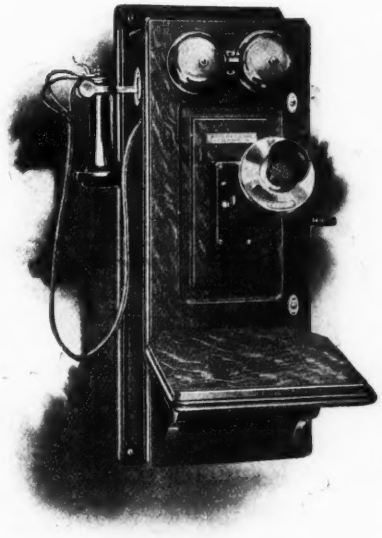
Perhaps the most noticeable of these changes to the average telephone user is the absence of the line binding posts from the top of the set. In connection with this new feature, it is interesting to note that the practice of the Western Electric Company for years past has been to place the telephone protectors at the point where the line wires enter the building. All the inside wiring and the building itself are thus protected. No provision has therefore been made to place the protector on the telephone sets, because the sets are seldom, if ever, installed at the point where the line wires enter the building. Moreover, a protector of the usual design when placed on the set introduces danger of personal injury and of fire on account of its proximity to the user and to inflammable material, such as curtains; it is also liable to be tampered with and dust is apt to settle on it and ground the line.

This practice of the Western Electric Company in placing the protectors at the point where the line wires enter the building, rather than on the telephone set, has enabled it to dispense with exposed binding posts on the telephone. The leading-in wires enter the set from the rear, and this not only improves the outward appearance of the telephone set but prevents accidentally short-circuiting its main binding posts.

The top of a wall telephone set is a most convenient spot to place articles, and many a telephone set with exposed binding posts at the top has been temporarily put out of service by some metallic object being unknowingly placed between them. Obviously, this would be impossible in the new telephone set illustrated herewith.

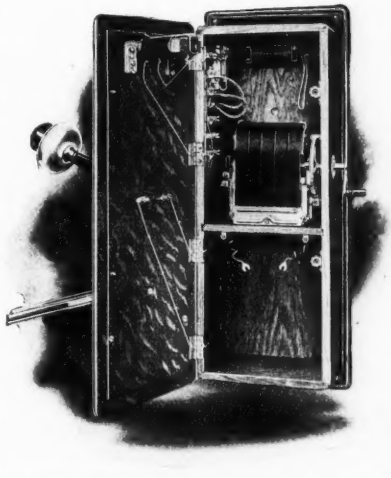
Accessibility to the working parts has been made a special feature in the design of the cabinet, in the mounting of the apparatus and in the left-hand swing of the door. Opening the door this way facilitates inspection of the generator, while turning its crank—a most important feature in time of need.

The hand generator has perhaps been developed to its highest stage of perfection in the five-bar generator included in this set. Comparative tests show it to be from thirteen to seventy per cent more efficient under practical working conditions, than other hand generators on the



NEW WESTERN ELECTRIC MAGNETO-TELEPHONE SET.

market, and it is guaranteed to ring the equivalent of forty 2,500-ohm bells on a thirty-mile full metallic line of No. 12 B. W. G. iron wire. The transmitter and receiver have the same high talking qualities for both local and long-distance trans-



INTERIOR VIEW, MAGNETO-TELEPHONE SET.

mission as the transmitters and receivers supplied by the company to all telephone users. The ringer is easy of adjustment and gives a loud, clear signal. The switch-hook is compact and self-contained.

Telephone sets of the descripton here noted are manufactured by the Western Electric Company for moderate and heavy-load bridging service where code ringing is employed, either with or without a condenser in the receiver circuit. The condenser insures the ringing of the bells, even if the receiver is left off the hook.

Developments in Mechanical Stoking.

The Westinghouse Machine Company, builder of the New Model Roney mechanical stoker, reports a large business in boiler-plant equipment for the last three months. The more important orders cover some thirty or forty equipments for various types of boilers in many different classes of service. Of these, government and state institutions have contracted for seventeen stokers, among which are the United States Naval Training Station, Chicago; the Iowa State Capitol; the Kentucky State Capitol; Central Kentucky Asylum; the city of Owensboro, Ky., and the Iowa State College. The Public Service Corporation, Jersey City, N. J., has adopted this type of stoker as the result of detailed competitive tests between Westinghouse and other makes, fifteen equipments being ordered for the present.

Traction interests have also ordered equipments, including the Kentucky Electric Company, Louisville, Ky.; Youngstown Heating Company, and the Nassau Light and Power Company. Further orders have come from the New York, New Haven & Hartford Railroad, Readville shops; the National Tube Company, of McKeesport, which already operates a large number of Roney stokers; the Crescent Portland Cement Company, Wampum, Pa.; the United Shoe Machinery Company, Boston, Mass., and the Newport Mining Company, Ironwood, Mich.

Among the smaller isolated lighting plants, may be mentioned the International Bureau of American Republics, Washington, D. C.; the Iron City Improvement Company, Pittsburg, Pa., and the Century Building, Cleveland.

In a number of instances the improvements embodied in the New Model Roney mechanical stoker have been considered of sufficient importance to occasion orders for change-overs for remodeling present stoker equipments along the lines of the New Model stoker. A large number of trial orders are also being recorded for the purpose of trying out the new improvements.

Electrically-Driven Ore-Handling Bridges.

At the Duquesne plant of the Carnegie Steel Company a large ore-handling bridge has recently been installed by Heyl & Patterson, incorporated, of Pittsburg, Pa. This is the first bridge of its type built by this company and possesses a number of interesting features. The bridge spans an ore yard of about 1,800 feet in length, serving six large blast furnaces. Adjacent to the furnaces are storage bins under which the larry cars operate to carry the ore from the bins to the furnace skips. One supporting leg of the bridge rests on this bin structure, and the other is carried by a concrete wall twenty-six feet high.

The bridge is of approximately 230 feet span between trucks and has a cantilever extension at either end of about

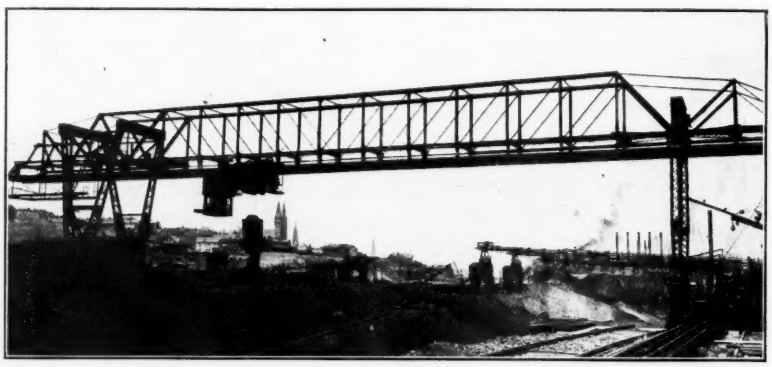
DETAILED VIEW OF "V" SUPPORTING LEG ON ORE BRIDGE AT DUQUESNE.

sixty-five feet. The iron ore is brought within reach of the bridge by transfer cars which operate between the car dumper a thousand feet or more from the ore yard and run on tracks carried by the bin structure. These transfer cars discharge their load through an open track onto baffle plates, which form a temporary pile along the bin side of the storage yard. By means of the grab bucket the bridge gathers up the ore and places it in storage or removes it from the storage pile and delivers to transfer cars for distribution into various compartments of the bins, from which the supply for the blast furnaces is drawn as needed. At the end of the bridge farther from the furnaces a V-shaped leg furnishes the support, while at the furnace end a single shear leg supports the bridge, as is shown in the accompanying illustration.

Throughout the design of this structure flexibility was sought; this provides for the inequalities in travel of the two ends of the bridge and absorbs endwise shocks and thrusts, due to the quick acceleration of the trolley, without straining the bridge.

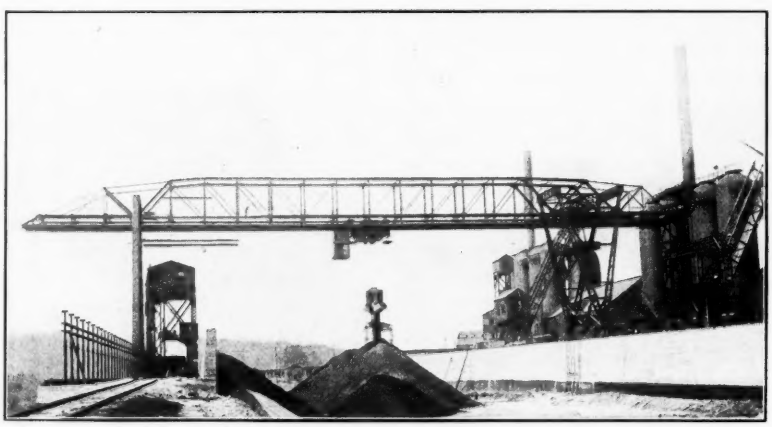
The bridge is propelled along its track by two fifty-two-horsepower Westinghouse type K crane motors, one on each truck, controlled from the cab. The two controllers for these motors are set adjacent and so arranged that a single handle moves either controller separately or both simultaneously. This arrangement allows one end of the bridge to be moved without affecting the other, and on a long travel should one end of the bridge structure get in advance of the other end the higher speed motor will be retarded until the slow one overtakes it.

The bucket is a ten-ton Hulett patent excavating bucket and is operated by two 225-horsepower Westinghouse crane motors of mill-type construction. The bucket with its load of ore weighs approximately 50,000 pounds. The trolley traversing mechanism is driven by a 225-horsepower Westinghouse mill-type motor, which is a duplicate of the two hoisting motors. The two bucket-operating motors are geared together and operate by a single magnetic type controller providing also for dynamic braking, thus removing a considerable item of wear of brake blocks from the trolley. The bridge is of very high capacity, having been constructed to handle 600 tons per hour. It has, however, within the last four months far outstripped this amount.



GENERAL VIEW OF YARDS AND ELECTRICALLY-DRIVEN ORE-HANDLING BRIDGE, DUQUESNE PLANT OF CARNEGIE STEEL COMPANY.

An equipment similar to this bridge in practically all respects has been supplied to the Youngstown Sheet and Tube Company, Youngstown, O. This machine also is giving very high satisfaction both as to speed and maintenance. The length of the Youngstown bridge is approximately 100 feet greater than that of the Carnegie Steel Company's, and the moving gear differs inasmuch as the bridge is propelled on its tracks by four motors instead of two, the trucks at all four corners being duplicate.



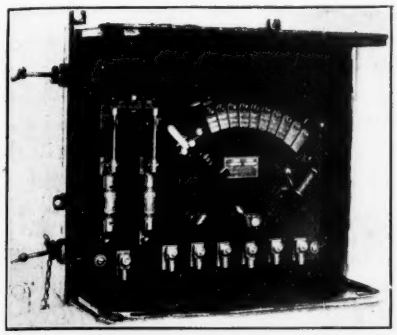
ELECTRICALLY-DRIVEN ORE-HANDLING BRIDGE AT THE YOUNGSTOWN SHEET AND TUBE COMPANY'S PLANT.

A High-Tension Rat Trap.

The town of Bellows Falls, Vt., was thrown into darkness when a large rat, in running across the back of an oil-switch in the power plant, came in contact with a line carrying 2,300 volts.

Controller for Battleship Motors.

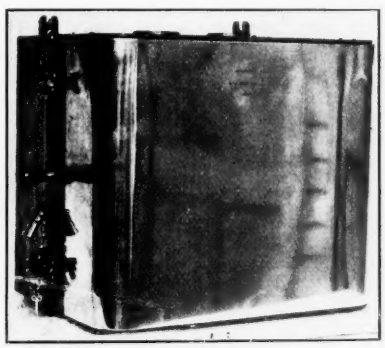
In a recent address before the Chicago Electric Club Lieutenant-Commander Witherspoon, U. S. N., described the very important part that electrical apparatus plays in the modern battleship. So necessary is the service called for from range



WARD LEONARD MOTOR STARTER WITH COVER REMOVED.

finders, telephones, lighting dynamos, speed indicators, motor-driven compressors and pumps, ammunition hoists, steering gear, etc., that the finest skill is employed to insure reliability of operation, and protection from damage.

Any device which will reduce the fire hazard and save space on a battleship is worthy of attention. The illustrations herewith show a Ward Leonard controlling panel for use in regulating motors for



WARD LEONARD MOTOR STARTER WITH COVER IN PLACE.

driving ammunition hoists on battleships. The panel consists of a line switch and fuses, and motor starter with no-voltage release.

The no-voltage release is connected across the line and is independent of the amperes passing through the motor. The entire rheostat is set into an enclosing case, consisting of a cast-metal back and sides, with a hinged sheet-brass cover. The line lead wires are led into the box through pipes screwed into the top of the box, and the motor lead wires are led from the bottom of the box in the same manner. The entire rheostat is "fool-proof," small, compact, and light in weight.

A Purely Electrical Annunciator.

To overcome the necessity for all mechanical devices of any kind in the construction of an annunciator, James and William Patten of New York city have invented and secured by patents an annunciator depending entirely for the action of its indicators and their restoration on pure solenoid control. Its principle is shown best by the two accompanying diagrams, of which Fig. 1 shows an annunciator adapted for service in an elevator car, and Fig. 2 shows the electrical circuits diagrammatically.

For each set of floor signals there is a set of four coils, constituting two independent solenoids, one for the "up" side and the other for the "down" side. Each of the latter has a sliding core to which is attached one of the floor numbers. The core is either square or oval in cross-section and fits a corresponding bore so as to keep the signal in an upright position. The outer coils *a* of the "up" side are connected to switches or buttons *b* on the different floors, and the coils *c* on the "down" side are connected to similar buttons *d*. These coils enable any desired signal to be displayed. The signals are restored by a single switch *e*, which can be made to close the circuit of either or both inner coils *f* and *g*, or of all these coils at the same time.

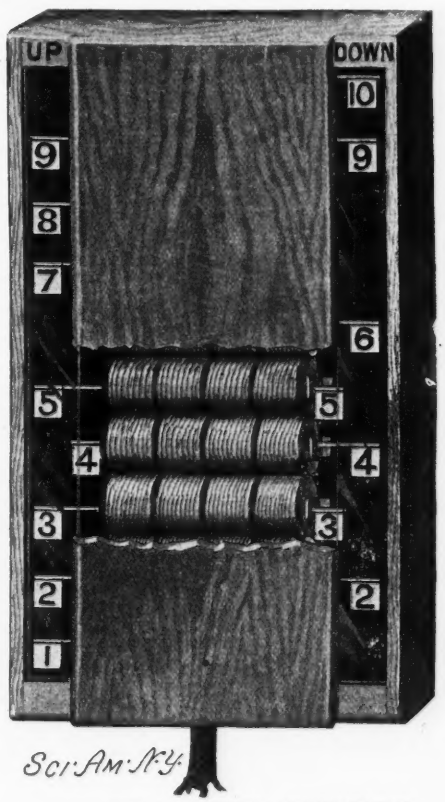


FIG. 1.—PATTEN ANNUNCIATOR.

The absence of levers and other mechanical devices makes this annunciator easy to keep in good repair and renders it quite compact.

The Wasson Reel.

The Wasson Reel Company, Clinton, Ill., has placed on the market a portable reel which facilitates the work of the lineman and groundsman in carrying from place to place the heavy reels of wire, and

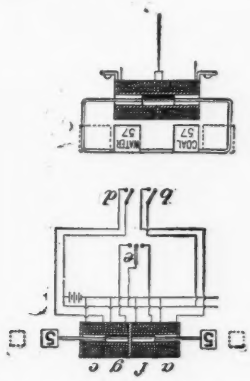
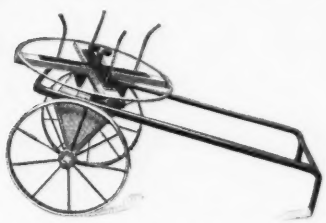


FIG. 2.—ELECTRICAL CIRCUITS.

the brackets, insulators, ropes and tools for the stringing of the line.

The carriage is made of steel and is reliable in all sorts of weather. It is provided with anchors to hold in a standing position and has the right slant for paying out the wire to the pole line. It has also the



THE WASSON REEL.

proper tension to keep the wire from running away when the lineman stops to climb a pole.

This reel carriage is particularly valuable for electric lighting, telephone, telegraph and railway companies. Although it has been on the market but a short time, it has become very popular in many parts of the United States and Canada and is available for but little more than the cost of the ordinary reel.

The inventor of the reel is B. F. Wasson, president of the company.

Dehydrating of Transformer Oils.

Extended investigations have shown that the presence of even slight percentages of water in oil has a deleterious effect on its insulating qualities. This is an extremely important matter in the case of transformer oils, for, while the coils are now generally given a special treatment to remove any trace of moisture, the use of ordinary oil that has not been dehydrated may more than neutralize any special precautions taken with the insulation of the coils.

A series of experiments on the drying of transformer oils has been made recently at the plant of the Niagara Electro-Chemical Company of Niagara Falls, N. Y. The following is an abstract of a report on this subject:

Sodium for Drying Transformer Oils.—Recent experience in connection with the drying of transformer oils has convinced us that by the use of metallic sodium moisture may be completely removed from oils which are to be used for insulating purposes. This means, of course, that the insulating qualities of the oil will be raised in a very marked degree.

The use of sodium for drying hydrocarbon oils is one that is familiar to every chemist who has ever measured the dielectric constants of these oils, where the sodium is usually added in the final operation to remove the very last traces of moisture. In the fear that the caustic soda formed by the reaction of the moisture on the sodium might be left as a liquid or a solid in the hydrocarbon, the chemist has usually thought it necessary to distill off from the sodium. In working on a very large scale this fear has been found to be groundless, and it is absolutely unnecessary to distill the oil.

Properties of Sodium.—Sodium has a density of about 0.97 at 15° C. (59° F.) and melts at 97° C. (207° F.). In transformer oil it will sink unless dragged to the surface by hydrogen gas. With water it reacts to form caustic soda and hydrogen. If very much water is present the caustic soda dissolves and in the presence of oil forms a second layer. If very little water is present the caustic soda is formed on the surface of the metallic sodium, and may be removed when removing the sodium. When the sodium surface becomes covered with caustic, it is advisable to remelt under oil, not letting the temperature rise above 120° C. (248° F.). After cooling and getting into the shape desired, it is again ready for use for drying more oil. Sodium should always be kept under a good transformer oil.

Method of Use of the Sodium.—One method which we have used with our own transformer oils has been the following:

The oil on the granulated sodium is poured off and a good transformer oil poured over the metal. To the oil which is to be treated, and which is put into an open tank or barrel, the sodium is added at first very carefully, about one ounce to the barrel. If much hydrogen is evolved, this will be conclusive proof that there is much water in the oil, and the balance of the sodium should be added carefully and in small amounts. The amount which is to be added depends upon the oil, but as a rule one pound to the barrel is usually much more than is required. The oil is then stirred up three or four times a day for a minute at a time. After several days the oil may be removed and tested, but the longer it remains over the sodium the better the oil becomes.

Another method used is to put the sodium in the form of sticks in a cylinder of iron wire of about twenty-eight mesh and to hang the cylinder in the oil. This method may be used directly with the dielectric which is in use, the only precautions required being those familiar to all electricians in the avoidance of short-circuits.

Results.—We have repeatedly taken oils which broke down at 3,000 volts and by letting them stand over the sodium for two days have brought their breaking points up to 20,000 volts or higher. Results as good as this have been obtained on a large scale by one of the largest power companies.

The metallic sodium used in these investigations was made by the Niagara Electrochemical Company itself and is sold by its agents, the Roessler & Hasslacher Chemical Company of 100 William Street, New York city.

An "Exide Smoker."

On Wednesday evening, March 31, at 8 o'clock, an "Exide Smoker" will be given under the auspices of the Electric Storage Battery Company, at the rooms of the Western Society of Engineers, Monadnock Building, Chicago, Ill. The following papers will be presented:

"The Exide Battery—Its Care and Operation," by Bruce Ford, of the Electric Storage Battery Company, Philadelphia, Pa., illustrated with lantern slides.

"The Relation of Central Stations to the Automobile Business," by E. W. Lloyd, Contract Agent of the Commonwealth Edison Company, Chicago.

All those who are present will be invited to participate in the discussion following the reading of these papers. The electric vehicle, both for pleasure and business, is no longer an experiment, but a success, and is undoubtedly growing in popularity throughout this country. The companies furnishing electric power are beginning to appreciate the opportunity offered them, not only by increasing their output, but improving their load factors by furnishing current for charging automobile batteries.

Artistic Publicity from the General Electric Company.

The General Electric Company, Schenectady, N. Y., is advertising its heating and cooking devices by means of striking photographs, each of which shows in some way the utility of the device advertised.

The most striking series of illustrations are reproductions from views taken in a beautifully furnished room, and showing a handsome woman using the chafing dish, coffee percolator, ruffle iron or griddle.

There is another series showing the comfort and luxury of a luminous radiator, the electric fireplace, the matchless cigar-lighter and the electric cooker.

There is also another series showing the utilization of washing machines, motor-driven meat choppers, buffers and grinders and other devices which enter into domestic life.

A Record Conduit Order.

The largest order for conduit ever closed in Chicago was contracted for, March 6, by the Chicago Railways Company, Chicago, from the Clay Products Company, whose factory is at Brazil, Ind. By the terms of the Chicago traction ordinances, the city street-railway companies must complete, within the next year, the rehabilitation now being carried out. The present order comprises the conduit needed to finish up this great undertaking, and amounts to 2,000,000 duct-feet of underground conduit. The conditions of delivery imposed the first laying to begin March 15, while the last delivery is to be made in November. Frank W. Darling is manager of the Chicago office of the Clay Products Company, in the Stock Exchange Building.

Rejuvenating Dry Cells.

On February 23, a United States patent was issued to Horace B. Ramey, of Alexandria, Va., on a method of revivifying dry cells. It consists in removing the pasteboard cover about the cell and the sealing material from its top. The zinc jar is then cleaned and perforated in a large number of places. About this is finally placed a receptacle impervious on the outside and coated on the inside with absorbent material impregnated with fresh electrolyte. Before sealing the cell again a little water is added at the top.

Current Electrical News

GREAT BRITAIN.

(Special Correspondence.)

LONDON, MARCH 6.—The British Committee of the International Electrotechnical Commission has appointed a sub-committee, with Dr. R. T. Glazebrook as chairman, to go into the question of the realization of an internatioinal standard of light, which was put forward by the French delegates at the recent conference in London. Others who will serve on this subcommittee are Dr. Sylvanus P. Thompson, Prof. C. Vernon Boys and J. W. Helps, the latter gentleman having been nominated by the Institution of Gas Engineers. Now that the co-operation of the gas industry has been obtained, there is every hope that a successful issue will be obtained.

The Associated Chambers of Commerce of the United Kingdom some time ago appointed a committee to continue the agitation against the abolition of the unlimited rate of charging for telephone service and the introduction of the message-rate system. In a report presented to a meeting last week, however, this committee has had to confess that their efforts have been unsuccessful.

The annual dinners of the English General Electric Company are events always looked forward to by the electrical industry, mainly owing to the certainty of several straightforward speeches on the question of our fiscal policy. This year was no exception, indeed, matters went a little further than usual in this respect, for, contrary to all precedent here in regard to after-dinner speeches, the function resolved itself into a debate upon free trade versus protection, or whatever one likes to call it. Gustav Byng, the chairman of the company, is a strong protectionist, although his position is a somewhat anomalous one, inasmuch as he has, as he was reminded, built up one of the best businesses in the electrical industry here, due to the circumstance of buying raw materials from abroad free of duty. Nevertheless, he made a very striking speech in which he claimed that Great Britain had taught the world the art of electrical manufacture and was now suffering from the efficacy of her pioneer efforts. The time was, he said, when Americans, French and Germans used to come to England to buy their electrical goods, but now, alas, we had lost the lead and had to follow other countries in matters electrical. He concluded by prophesying that free-trade England would come to an end in 1912. Many of his guests, however, totally disagreed with him.

An interestinig case was before the courts last week. A tramcar driver in the employ of the West Ham Corporation when off duty was a passenger on one of the corporation cars and while steadying himself on the upper deck laid his hand upon the trolley post, which unfortunately happened to be "alive." He received severe burns and as a result was discharged from his employment as driver. He subsequently sued the corporation for damages and was awarded $2,500 damages. The judge, however, has refused to enter judgment for the amount owing to the plea raised by the corporation that in their book of regulations they stipulate that, as the passengers are being carried at less than the statutory fares, their liability for damage due to accidents is limited to $125. The corporation claim that the mere notification to this effect relieves them from any further liabilitiy, and the point of law is to be argued before the judge.

An official document has just been published dealing with the receipts and expenditure of the post office in respect of telegraphs and telephones for the past financial year. The total income amounted to $22,420,500, as against $21,846,000, and the expenditure to $26,682,500, against $25,059,500. As the expenditure includes several items in the nature of capital disbursements the adverse balance is reduced to only $650,000, a welcome reduction in view of the heavy losses in previous years ever since the telegraphs were taken over by the state. G.

WESTERN CANADA.

(Special Correspondence.)

WINNIPEG, MARCH 13.—Cecil B. Smith, C. E., Toronto, Ont., has been retained by the Calgary Power and Transmission Company, Calgary, Alta., in connection with the development of electrical energy at Horseshoe Falls.

The British Columbia Electric Street Railway Company has accepted plans for a $200,000 office and terminal building to be erected at Vancouver, B. C., tenders for the construction of which will be called this month. R. H. Sperling, general manager, Vancouver, B. C.

F. Laidley, Swift Current, Sask., has obtained a ten-year franchise for the erection of an electric light and power plant in that town and for the distribution of electricity.

T. H. McCauley, formerly manager of the Twin City Electric Railroad Company at Port Arthur, Ont., has been appointed manager of the municipal system being installed at Calgary, Alta.

The Alameda Rural Telephone Company is being organized at Alameda, Sask., for the purpose of building rural lines to surrounding districts. Address A. D. Truscott, Alameda, Sask.

At the annual meeting of the Oxbow Telephone and Lighting Company, held at Oxbow, Sask., it was decided to build rural lines to Auburnton, Arthur, Boscurvis and Glen Ewen. Address J. P. Tripp, Oxbow, Sask.

For several days an interesting controversy was engaged in between the Winnipeg Electric Company and the Public Parks Board at Winnipeg, Man. The parks board wanted power to operate a pump and supply light at the new city park. The company agreed to supply the necessary current upon receipt of a signed order from the city. The city refused to issue this order on the grounds it would prejudice the city's suit against the company to restrain the latter from distributiing power in Winnipeg. However, the company finally decided to supply the park with power and the delayed work was proceeded with.

Winnipeg has let contracts for the construction of the transmission and telephone lines in connection with the power development at Point du Bois. Had it not been for some unexpected delays, the city would now be doing the work by day labor. The Williamson Construction Company, Toronto, Ont., will build the transmission line for $118,424, while R. and D. McLeod, Winnipeg, will build the telephone line for $23,241.

F. C. Patterson, chairman of the Manitoba Telephone Commission, announces that a new exchange will be built in the west end of Winnipeg during the present summer.

The Springside (Saskatchewan) Rural Telephone Company, recently incorporated, will build eighty miles of line this year, with switchboards, at Springside, Theodore and Beaverdale.

The city of Nelson, British Columbia, has purchased the plant, franchise, etc., of the Nelson Tramway Company and will re-equip the system and put it in operation. Address W. Garland Foster, Nelson, B. C.

The Saskatoon Telephone Company, with head office at Saskatoon, Saskatchewan, had a most successful year during 1908. After paying for all extensions and construction the financial statement shows a profit for the year of twelve-and-one-half per cent. At the annual meeting a dividend of eight per cent was declared, the balance being placed to capital account. R.

LIGHTING AND POWER

(Special Correspondence.)

LEESBURG, FLA.—The city of Leesburg is considering the construction of an electric-light plant.

GENESEO, ILL.—The Geneseo Electric Light Company of Geneseo will institute a day service April 1.

ST. HELENS, ORE.—The St. Helens Mill Company is preparing to install an electric-light plant here. A.

HEBER, ARK.—The Heber Light Company has been organized by A. M. Hilber, Howard Reid and others. P.

WHARTON, TEX.—J. J. Wensley has been granted a franchise for an electric-light plant at Wharton. P.

HARTINGTON, NEB.—Mark Hurlburt has asked Hartington for a franchise for an electric-light and power plant. P.

CROWELL, TEX.—The City Council has granted a franchise for electric lighting to L. G. Andrews and W. L. Campbell.

WYMORE, NEB.—It is proposed to take a vote on issuing $10,000 bonds for the construction of an electric-light plant. C.

GILMER, TEX.—The Gilmer Ice, Light and Power Company has succeeded to the business of the Gilmer Light Company. P.

CLIFTON, TEX.—W. G. Scarff and others, of Dallas, Tex., will incorporate a company to put in a light plant at Clifton. P.

VIDALIA, GA.—Voters of Vidalia contemplate the issuance of $9,000 of bonds for improving waterworks and electric-light plant.

TONKAWA, OKLA.—The city of Tonkawa contemplates the installation of an $18,000 electric-light plant. J. P. Jarolemon is mayor.

UNION, ORE.—Plans are being completed in Union for the construction of a new municipal lighting plant, to cost about $20,000. A.

KINSTON, N. C.—Kinston contemplates voting on issuance of $75,000 of bonds for extension of light system, etc. Address the mayor.

WHITEVILLE, TENN.—Edward Stewart and Rivers Norment will construct an electric-light plant in Whiteville to cost about $5,000.

ELBERTON, GA.—Elberton has voted a $5,000 bond issue for improvements to the electric-light plant. Address the mayor for information.

MANSFIELD, LA.—The Mansfield Ice Plant and Light Company is negotiating with the city for the purchase of the municipal light plant for $6,150.

GLENDALE, CAL.—Bonds are to be issued to the amount of $60,000 by the City Council for the construction of a municipal light and power plant. A.

YACOLT, WASH.—A franchise has been granted J. Coulter for an electric light and power plant in this city, to be completed before September 1. A.

QUINCY, CAL.—Plans are now under way by J. E. Sanfear of this city for an electric light and power plant to be installed on Taylor Creek, near here. A.

PASADENA, CAL.—Bonds have been issued to the amount of $150,000 for city improvements and the extension of the municipal electric-light plant. A.

CHICO, CAL.—Frank C. Wilson, representing the Sierra Electric Power Company, has applied for a franchise for an electric-light and power system. A.

NORTH YAKIMA, WASH.—The City Council has appointed a committee to secure figures and estimates as to the cost of a municipal electric-lighting plant. A.

MOORE, MONT.—Geo. I. Fogle, of Anaconda, Mont., will establish an electric-lighting and power plant, with Robert Fogle, formerly of Bozeman, as superintendent. C.

MINOT, N. D.—The Minot Light and Telephone Company has contracted to furnish power for the pumping station of the new water-works for three cents a kilowatt. C.

JEFFERSON, TEX.—Jefferson Ice, Light and Power Company has been incorporated with $50,000 capital stock by John T. MacDonald, M. Bower and R. B. Walker.

CHICAGO, ILL.—The Calumet Electrical Construction Company has been formed by Charles J. Carroll, James J. McGovern and Orie A. Keeler, with a capital stock of $2,500.

BAKERSFIELD, CAL.—John McWilliams, Henry J. Martens, and others, are to build an electric power plant at the mouth of the Kern River Canyon, near the Kern oil fields. A.

RALEIGH, N. C.—The legislature has adopted a measure permitting the Piedmont Railway Company to operate between High Point and other towns and to amend its charter.

WASHINGTON, GA.—C. S. Lucas and associates contemplate the construction of a waterpower-electric plant, about ten miles from Washington, to furnish power for lighting the city.

CHICKASHA, OKLA.—The Chickasha Gas and Electric Light Company has been incorporated with $175,000 capital stock by Lawrence Martin, Dennis O'Brien, A. A. Humphrey and C. E. Ross.

JEFFERSON CITY, MO.—The Missouri Electric, Gas and Water Company has been incorporated with $50,000 capital stock by Harry B. Tyson, Joseph Barbo, W. W. Goodall and others.

SANTA FE, N. M.—Manager Owen, of the Santa Fe Water and Light Company, has completed arrangements for the construction of a concrete electric-light plant to be erected in this city. A.

DES MOINES, IOWA—The contract for the installation of an electric light and power plant at the county jail has been awarded to the Erie City Iron Works, of Erie, Pa., for $10,500. C.

MONTEZUMA, IOWA—The Montezuma Electric Light and Power Company has reincorporated as the Montezuma Electric Light, Power and Heating Company, with a capital stock of $6,000. C.

GREENVILLE, TENN.—The citizens of Greenville will vote, March 20, on the issuance of $40,000 of bonds for purchasing or erecting electric-light and waterworks plants. Address the mayor.

CROOKSTON, MINN.—As soon as spring opens the Crookston Water Works, Power and Light Company will commence the construction of a big dam in the Red Lake River, eleven miles northeast of the city. C.

BUTTE, MONT.—The Madison River Power Company has completed arrangements for the construction of its transmission line from Billings to Livingston, by way of Laurel, Park City, Columbus and Big Timber. A.

MANGUM, OKLA.—The Mangum Electric Light and Power Company has been incorporated with $100,000 capital stock. C. I. Patterson is president; P. A. Janeway, vice-president; J. W. Chambers, secretary-treasurer.

MONTAGUE, CAL.—The Siskiyou Electric Power and Light Company is ready to begin work on its new power plant at Ward's Canyon, on the Klamath River, which will be capable of developing 64,000 horsepower. A.

CHICO, CAL.—Following the application of Frank C. Wilson, representing the Sierra Electric Power Company, the trustees will receive bids until April 2, 1909, for a fifty-year franchise for a lighting and power system in this city. A.

MONROE, N. C.—The Southern Power Company, of Charlotte, has purchased a site on which to erect a transformer station. Electricity will be transmitted from the waterpower-electrical development on Catawba River, near Charlotte.

AUSTIN, MINN.—The light commission has reduced the price of electricity from ten to eight cents per kilowatt. The plant is owned by the city, which purchased it from the company ten years ago when the price was twenty cents per kilowatt. C.

FORT WORTH, TEX.—The City Commission is about to adopt an ordinance authorizing the expenditure of $62,605.45 for improvements to the municipal electric light plant, including not less than 400 new arc lamps. Write to City Engineer Tremmell.

GLENDALE, CAL.—A combination of local men has been formed by Frank Campbell, L. C. Brand, J. F. McIntyre and D. Griswold for the purpose of forming a company, with a capital stock of $150,000, to furnish electricity and gas to Glendale and vicinity. A.

CARROLLTON, GA.—An election has been ordered at Carrollton for March 30, to determine the question of issuing bonds either for purchasing and enlarging the local electric-light plant, or for building a new plant. The contract for lighting, now held by a private concern, expires shortly. L.

EAGLE RIVER, WIS.—The special election held for the purpose of granting free electric power to the aluminum plant, which will employ 150 hands, has resulted in 153 votes for and 9 against. This is the initial industry for Eagle River's new $100,000 dam, generating 1,300 horsepower.

SENECA, S. C.—The contract for building the new Seneca town-lighting system was awarded to the Piedmont Electric Company, Anderson, S. C., there being fourteen bids all told. The generator will be a Westinghouse three-phase- sixty-cycle, 2,300-volt machine. The town will build the power house. L.

CHARLESTOWN, MISS.—An electric-light plant is about to be installed at Charlestown. The equipment will probably be for tungsten street lighting, employing alternating current at 1,100 volts, sixty cycles. Information will be gladly received by Mr. Saunders, mayor of Charlestown, or the Lamb-Fish Lumber Company.

HORNBROOK, CAL.—The Siskiyou Electric Company has received equipment for the extension of its power lines from Snowdon to the mines on the Klamath River below Hornbrook, and will begin construction immediately. Work will begin about April 1 on the proposed line through Little Shasta Valley to Sisson and Dunsmuir. A.

ZIRCONIA, N. H.—The Green River Manufacturing Company, of Zirconia, has about completed the mill it has been constructing during the past year. It has installed about 7,500 spindles and accompanying apparatus, for the production of fine combed yarns. The machinery is driven by electricity generated in the company's waterpower plant.

TOWER MILLS, L. I.—Muralt & Company, of New York city, have been awarded the contract for remodeling and enlarging the waterpower plant on the Peconic River at Tower Mills. New turbines of the vertical-shaft type will replace the old waterwheels now in use and an additional unit of the same general design will be installed.

ASHLAND, ORE.—The temporary injunction held by the Electric Light Company against this city was dissolved by the circuit court this week and the city is again able to proceed with the issuance of bonds for the construction of its municipal light and power plant. Bonds for $77,500 have been sold to Morris Brothers of Portland, Ore. A.

FORT WAYNE, ALA.—The Alabama Railway and Power Company plans to build a waterpower-electric plant to transmit electricity for power to Birmingham and intervening towns, a distance of seventy miles from the proposed power plant. The president is H. T. Henderson, of the Henderson Engineering Company, Durango, Colo.

KRAMER, IND.—The Indiana Springs Company, Kramer, Ind., has placed an order with the Central Laboratory Supply Company, Lafayette, Ind., for a complete electric-lighting plant, to consist of two generating units, a switchboard and a number of motors. The installation is being made under the direction of J. W. Esterline, consulting engineer.

ALBANY, N. Y.—The upstate Public Service Commission has given consent to the consolidation of the Watertown Light and Power Company and the Watertown Gas Light Company. A previous application made to the commission was strenuously opposed by the city government of Watertown, and on July 13 last the commission denied the application.

RICHMOND, VA.—The committee on electricity of the Common Council has reported favorably an plans and specifications for the new municipal electric-light plant and the report has been adopted by the Common Council, and the committee was empowered to call for proposals. The plans were drawn by Pressley and Weller, consulting engineers. L.

FREDERICKSBURG, VA.—The Electric Generating Company will lease waterpower from the Fredericksburg Power Company and expects to build an electric plant with a capacity of 2,000-horsepower. William C. Whitner, president of Fredericksburg Power Company, will probably act as consulting engineer in preparation of plans for power house and hydraulic development. The plans will be ready April 1.

MACON, GA.—Application has been made to the Town Council by the Central Georgia Power Company for a franchise to construct transmission lines in and through the town for utilization of power to be generated at the company plant near Jackson, Ga. The company will begin operations in the coming twelvemonth, it is said, and the application will be acted upon immediately by the Macon Council. L.

SAN FRANCISCO, CAL.—The Great Western Power Company has repaired the nine miles of steel towers overthrown by the storms of last January and is again supplying the bay cities with power. The towers which were previously buried in the earth are now set in concrete foundations. Excavation work is under way for the company's sub-station at Brighton, Cal., and construction will be started at once. A.

ANSONVILLE, N. C.—A waterpower near this town, the property of A. H. Richardson, of Charlotte, N. C., is being surveyed with a view to probable development, there being an available fall of 150 feet within a distance of half a mile, by digging a canal part of which will be provided for by the natural lay of the land. A. F. Lyman will make the survey along a horseshoe bend in the river, which creates a rather unusual but economic waterpower possibility. L.

NEWCASTLE, VA.—The Craig Waterpower Company will develop two waterpowers; each to generate 2,500 horsepower. The first plant on Meadow Creek, Newcastle, will develop 2,500 horsepower under a fall of 800 feet head. Its equipment will include a steel-tower transmission line twenty miles long, to Roanoke, with capacity for both plants. The second plant, to be installed later, on Johns Creek, is to develop 2,500 horsepower under 225 feet head. A. L. Sibert is president, and C. S. Wenger is engineer in charge.

SAN FRANCISCO, CAL.—James K. Moffitt, J. D. Galloway, H. P. Goodman and E. H. Rollins & Sons, bondholders in the Stanislaus Electric Power Company, Stanislaus Electric Railway Company, Tuolumne Water and Power Company and the United Construction Company, have authorized Attorney Chas. P. Eels to contest the foreclosure of the mortgage held against those companies by the Knickerbocker Trust Company of New York. The other defendants have filed answers consenting to the foreclosure of the mortgage and the sale of the properties. A.

TERRE HAUTE, IND.—Incorporation papers have been filed with the Secretary of State by the Vigo Electric Company with a capital of $200,000. The object of the company is to construct and equip a generating plant to manufacture, transmit and distribute electric current to towns, cities and to the public generally for heating, lighting and power purposes. The incorporators are: F. M. Fauvre, Charles Moniger and Monroe George. This company is building a plant near a coal mine a few miles from Terre Haute and is now securing contracts to light towns and cities. S.

TOLEDO, O.—C. J. Nolan, superintendent of the Libbey Glass works at Toledo, O., has perfected a machine which promises to revolutionize the electric bulb-blowing industry. Under an agreement with the American Flint Glass Workers' Union two of these machines will be installed at the Libbey glass plant, to run for a period of ninety days. The machine is pronounced a marvel by those who have seen it. It will replace three glass blowers and in Toledo alone will do away with the work of 200 men engaged in this work. It has a capacity of 3,600 electric light bulbs in eight hours. It will not do away with the gathering boys and cleaners. If the ninety days' trial proves successful the Libbey Glass Company will take up the machine and develop it. H.

DANVILLE, VA.—The Dan River Power and Manufacturing Company, Danville, Va., at a stockholders' meeting held recently decided to erect a $1,000,000 addition to the plant at Danville. The decision is to build a modern plant of 50,000 spindles and 1,500 looms for the production of cotton fabrics. The plans will call for the erection of a three-story building, 550 by 150 feet, in which the textile-manufacturing machinery will be placed. The power will be electricity, and it will be transmitted through the mill from the company's waterpower plant. An auxiliary steam plant will be provided for emergencies.

CHARLOTTE, N. C.—The new city charter, containing a section placing the regulation of rates of public utilities in the hands of the board of aldermen, will be voted on at a special election April 6. As the present city charter has been amended in the same manner, the "rate clause" will become effective during the month of May in any event, but it is not believed that this power will be made use of by the city authorities, they also having power to regulate the service, to which latter proposition no objection was offered by the public utilities corporations doing business here. A tax of one dollar on each pole in the city limits may also be imposed. L.

PUBLICATIONS.

RAILWAY STATISTICS.—Railway Statistics of the Dominion of Canada for the year ended June 30, 1908, has been published. This contains the report which has been made up from sworn returns furnished by the several railway companies.

FIVE-YEAR TOPICAL INDEX OF THE ELECTRIC JOURNAL—The Electric Club, Pittsburg, Pa., has published a five-year topical index of the *Electric Journal*. This index summarizes the articles published in Vols. 1, 2, 3, 4 and 5 from December, 1904, to December, 1908. The index is arranged according to the topical classification of electrical and railway engineering references published in the February issue of the *Electric Journal*. The references do not necessarily bear the author's titles of the articles, but aim rather to give good conceptions of the subject-matter. Four broad divisions are made as follows: Mechanical Engineering, Electrical Engineering, Railway Engineering and Miscellaneous. These classifications are further subdivided and the references are printed only on one side of each sheet so as to make it possible for the pasting up or notation of special references.

THE DETERIORATION OF LEAD SHEATHS OF TELEPHONE CABLES—One of the most important papers read before the conference committee of representatives of the leading independent telephone operating companies at Boston, Mass., on January 23, was that by Thomas G. Spencer of Rochester, N. Y., entitled "The Deterioration of Lead Sheaths of Aerial and Underground Telephone Cables." This paper takes up the analysis of the metallic characteristics of the lead sheath and outlines the causes of deterioration and the probability of injury. The proper handling of the cable is indicated and a number of suggestions made with regard to decreasing the maintenance through the establishment of proper engineering requirements. This paper has been reprinted in bulletin form and will be sent to anyone interested upon application to the Stromberg-Carlson Telephone Manufacturing Company, Rochester, N. Y.

ELECTRIC RAILWAYS.

(Special Correspondence.)

WEATHERFORD, TEX.—A street-railway franchise has been granted to J. T. Patterson and associates of Weatherford.

GLOBE, ARIZ.—George W. P. Hunt has been granted a twenty-five-year franchise for an electric street railroad in this city. A.

DULUTH, MINN.—Charles P. Craig is interested in the construction of a suburban line from the city limits to the Jean du Luth farm. C.

WALLACE, IDAHO—W. J. Hall, representing the Cœur d'Alene Electric Company has been granted an electric railway franchise in this city. A.

SAN ANTONIO, TEX.—The San Antonio Traction Company contemplates building a four-mile extension to the stockyards and Palm Garden, a suburb.

HOPKINSVILLE, KY.—Stockholders of the City Light Company are reported to contemplate building a street railway. E. K. Dewey is vice-president and general manager.

PORTLAND, ORE.—F. I. Fuller, representing the Portland Railway, Light and Power Company, announces that during the coming year short extensions will be made on some of the present lines in this city. A.

ANDERSON, S. C.—The Anderson Traction Company will solicit $150,000 preferred stock for the purpose of paying off the company's indebtedness and of taking the company out of the hands of a receiver, and to build a nine-mile extension to the town of Pelzer, costing $100,000. Later reports are that the

stock is being rapidly subscribed. The company operates eighteen miles of track. L.

LEWISTON, IDAHO—W. A. Leet and C. A. Taylor of Salem, Ore., have purchased the Nez Perce & Idaho Electric Railway Company and will complete the remaining fourteen miles of the road in the next sixty days. A.

CORPUS CHRISTI, TEX.—M. Ucovitch of Corpus Christi has applied for an electric street-railway franchise. W. B. Tuttle, general manager of the San Antonio Traction Company, is also reported to be interested.

EUGENE, ORE.—The Lane County Asset Company is making preliminary surveys for an electric railway from Eugene to the mouth of the Suislaw River. Within ninety days the company expects to commence construction work. A.

CINCINNATI, OHIO—At the annual meeting of the Cincinnati, Newport and Covington Light and Traction Company today Louis J. Hauck was elected a director to succeed Joseph S. Trevor. The other retiring directors were re-elected.

SAN FRANCISCO, CAL.—An agreement has been made between the United Railroads and the State Harbor Commissioners by which the company, after March 1, will pay $250 per month for the right to operate its cars on East Street. A.

MINNEAPOLIS, MINN.—C. J. Swanson, with offices in the Kasota Block, and others are organizing a company to construct an electric road from Minneapolis to Anoka, passing through Fridley, which town alone has pledged $75,000 toward the undertaking. C.

VALLEJO, CAL.—As a result of the application of Randall, Wright & Trowbridge of Oakland for a franchise for an electric line from this city to Benecia and White Sulphur Springs, the Board of Supervisors will receive bids until April 1 for the sale of the franchise. A.

GRAND JUNCTION, COLO.—Negotiations have been completed for financing the Fruit Belt Electric line, which is to be constructed from Palisade down the valley through Grand Junction and Fruita to De Beque, a distance of forty miles, at a total cost of $4,000,000.

SPRINGFIELD, ILL.—The Illinois Inland Electric Railway has been incorporated at Springfield to construct an electric line from Pana to Springfield. The capital stock of $50,000 has been subscribed by the incorporators, G. W. Davidson, C. O. Beroth and T. C. Kennedy.

LAFAYETTE, IND.—The Ft. Wayne & Wabash Valley Traction Company has disposed of $1,000,000 first-mortgage bonds, the proceeds to be used for the construction of a new power house in this city and the improvement of the line between this city and Logansport. S.

PLUM, WASH.—For the purpose of building an electric line from Plum, Wash., on the Columbia River, to Coulee City, about fifty miles, Seattle capitalists have organized a company, and the surveys and right-of-way have been purchased. A power site at Monoghan Rapids, about twelve miles from Plum, will be developed.

GRAND FORKS, N. D.—The Grand Forks Electric Railway Company has appointed Edward P. Burch, consulting engineer, Minneapolis; Minn., to draw plans for its electric-railway system in Grand Forks and East Grand Forks and for its motive power. It is understood that purchases will be made at the consulting engineer's office.

TERRE HAUTE, IND.—Contractors for the Terre Haute, Indianapolis & Eastern Traction Company have begun work on the construction of a new power plant. This plant will be equipped with a battery of four boilers, a 300-kilowatt turbine, automatic coal and ash handling apparatus, and will have a capacity of 500 horsepower. S.

WASHINGTON, PA.—A project is being considered for the construction of an electric railway from Washington, Pa., via Marianna and Waynesburg, to Morgantown, with a branch line from Waynesburg to Brownsville to connect with the Charleroi line. Among those interested are Representative George C. Sturges and Davis Elkins, son of Senator Elkins.

INDIANAPOLIS, IND.—At a meeting of the stockholders of the Columbus, Greensburg & Richmond Traction Company, held in this city March 10, the old board of directors were elected, and in turn elected the following officers: President, A. M. Kuhn; secretary, Robert E. Moore, Indianapolis, and W. J. Walters of Richmond, treasurer. Plans were discussed for building a line from Columbus to Greensburg and Richmond this year. S.

TOLEDO, O.—An interesting meeting was held at Lima this week by the accounting departments represented in the Central Electric Railway Association of Ohio, Indiana and Michigan. The purpose of the meeting was the adoption of a uniform system of inter-railway accountiing. More than thirty traction lines are represented in the agreement. M. W. Glover, auditor of the Ohio Electric Railway Company, was chairman, and C. W. Baker, of the Western Ohio Electric Railway Company, secretary. H.

ALBANY, N. Y.—The plan of the New York Central & Hudson River Railroad Company for the refinancing and reorganization of its electric and lighting properties in New York state has come before the Public Service Commission, Second District, on the application of the Rochester Railway Company and the Sodus Bay Railway Company to consolidate and to authorize the Central to take over the capital stock of a new corporation to be known as the New York State Railways. Through the latter company it is hoped to merge the so-called Vanderbilt properties.

GULFPORT, MISS.—The Gulfport & Mississippi Coast Traction Company will largely increase the present capacity of its Gulfport plant by the installation of a 1,500-kilowatt Parsons steam turbine, which has been ordered for shipment on May 1. A storage-battery plant of "Chloride accumulators" is being added to the Gulfport station and the company is at present building six miles of additional track, which will extend its trolley system from Long Beach to Pass Christian, Miss. At the latter town it will also install and operate an electric-lighting system.

CHICAGO, ILL.—The Chicago Railways Company has let a contract for approximately 10,000 car wheels for the north, west and northwest side car lines. The order, which is said to be largest single order for wheels ever placed by a street car company, was placed with the Carnegie Steel Company. All new cars will be equipped with the "noiseless" wheels and they will also be used for renewals on old cars. The life of the new solid steel forged and rolled wheels is placed at 140,000 miles, while the duration of a cast-steel wheel, the kind now in use, has been considerably less than 40,000 miles. They scale in at approximately 800 pounds the car less than the old wheels.

NEW YORK, N. Y.—Following the application of the McAdoo tunnel companies to build a subway from Thirty-third Street and Sixth Avenue to the Grand Central Station, and the announcement of President Shonts of the Interborough that this company has a $50,000,000 subway plan in contemplation, the Public Service Commission received on March 9 from William J. Wilgus and his associates in the recently formed New Amsterdam corporation, a proposal to construct, if suitable legislation is obtained, a belt line elevated and subway road for both passengers and freight as far up as Fifty-ninth Street, with crosstown connections under Fifty-eighth Street and under Forty third Street, Seventh or Eighth Avenue and Thirtieth Street. Mr. Wilgus has as associates Gustav H. Schwab, the general agent of the North German Lloyd; the banking house of C. D. Halsey & Company of 15 Broad Street, the large contracting firm of J. G. White & Company, P. A. S. Franklin of the International Mercantile Marine, the banking firm of Hodenpyl, Walbridge & Company of 7 Wall Street, a concern that has had much to do with the financing of traction enterprises, and C. C. Cuyler of 44 Pine Street, the newly-elected president of the United States Mortgage and Trust Company. The name under which the Wilgus project is now advanced is the Inter-Terminal Belt Line.

NEW YORK, N. Y.—President Theodore P. Shonts of the Interborough-Metropolitan Company sent to the Public Service Commission on March 10 a letter embodying the outline of the Interborough's proposed plan of subway extension, which is said to involve the expenditure of $50,000,000 of private capital and $1,000,000 of the city's money. In its briefest terms the plan contemplates a west side two-track express subway from Times Square to the Battery, an east side express subway up Lexington Avenue from the Grand Central Station to connect with the present Lenox Avenue branch at 149th Street, third tracks on the Second and Third Avenue elevated lines, and the extension of the stations in the present subway so as to accommodate ten-car express trains and six-car locals. The opposition of the Interborough Rapid Transit Company urged before the Public Service Commission to the application of the Hudson & Manhattan Railway Company for permission to extend its tunnel from the present terminal at Thirty-third Street and Sixth Avenue to the Grand Central depot appeared to hinge largely on the contention that the Belmont interests would be impeded at a most important point in their efforts to give an extension of transit facilities to the public of this city.

TELEPHONE AND TELEGRAPH.

(Special Correspondence.)

RAYMOND, WASH.—The Willipa Harbor Telephone Company has been incorporated here. P.

HIGHMORE, S. D.—The Van Order Telephone Company has been incorporated, with a capital stock of $2,000. P.

PIERRE, S. D.—The U. S. Sonora Telephone Company has been incorporated, with a capital stock of $200,000. P.

BROWNS VALLEY, MINN.—The Browns Valley Telephone Company has been incorporated, with a capital stock of $50,000.

MINCO, OKLA.—The Consolidated Telephone Company has been incorporated, with a capital stock of $5,000. P.

NORMAN, OKLA.—The Norman Telephone Company will spend about $50,000 in improvements at Norman. P.

ST. JOSEPH, MO.—The Citizens' Telephone Company has changed its name to the Home Telephone Company. P.

KNOWLES, N. M.—The Knowles-Monument Telephone Company has been incorporated, with a capital stock of $10,000.

NORTH PLATTE, NEB.—The South Side Mutual Telephone Company has been incorporated with a capital stock of $5,000. P.

WHAT CHEER, IOWA—J. T. Snouffer, manager of the local telephone company, is considering the installation of a new switchboard. C.

SAN FRANCISCO, CAL.—The Home Telephone Company will build two more substations in this city, the plans of which are now complete. A.

SAN JUAN, CAL.—A farmers' telephone line, to be known as the Old Mission Telephone Company, is being organized here by W. W. Canfield.

VISALIA, CAL.—The Tulare Home Telephone and Telegraph Company has been incorporated here with a capital stock of $25,000 by E. W. Rice, G. C. Harris, B. W. Chenowth, Scott Hendricks and T. J. Franklin.

ELY, NEV.—The Spring Valley Telephone Company has been incorporated here to operate a telephone line between Muncy and Oseola, Nev. The incorporators are E. L. Fletcher, Henry C. Nicholson, Joseph E. Stevens and Eugene Giles. A.

TOLEDO, O.—A handsome new three-story building will be erected at Lima, O., early this spring to be used exclusively by the Home Telephone Company of that city. The building will be erected on West North Street and will cost $17,000. H.

COMO, IND.—The Como Telephone Company has incorporated with a capital of $10,000. The company proposes to build and equip a telephone system in Como, and in Jay, Wells and Randolph counties. Directors: J. L. Resur, O. E. Lacy, D. W. Bell, J. H. Dull and G. C. Day. S.

BLAIRSBURG, IOWA—Farmers in Blairsburg township have organized the Cedar View Telephone Company, with G. W. Coleman, as president; P. C. Stone, treasurer, and H. L. Doty, secretary. A line will be built to Webster City to connect with the Hamilton County Independent Company. C.

MICHIGANTOWN, IND.—The stockholders of the Michigantown Telephone Company have elected the following officers: President, William Huffer; secretary, Charles Delhi, and treasurer, Chas. W. Everman. The directors voted to purchase material and increase the capacity of the plant. S.

NEW YORK, N. Y.—Wireless messages from the station on the pier at Atlantic City brought aid March 11 to the schooner Ann J. Trainor, which was later reported coming up the New Jersey coast in tow of an ocean-going tug. The vessel was almost dismantled and wreckage incumbered her deck.

FREDERICKSBURG, VA.—The stockholders of the Potomac & Rappahannock Telephone Company, in Westmoreland County, at a recent meeting decided to continue their lines on to the town of Montross, the county seat of Westmoreland, and also to build a line from Colonial Beach to Fredericksburg. The lines in operation are proving great conveniences to patrons. L.

SEATTLE, WASH.—The United Wireless Telegraph Company has begun the erection of a three-story building in this city for the manufacture of wireless telegraph instruments. The machinery to be installed is estimated to cost about $8,000. Two representatives of this company left this week for the Orient, where they are to install instruments. Efforts are to be made by these men to establish a trans-Pacific wireless record.

WASHINGTON, D. C.—In the Supreme Court the Western Union Telegraph Company has lost its appeal from the judgment of the Virginia court upholding the validity of the law of that state providing a penalty of $100 for failure to deliver a telegram. This company alleged that as it was necessary in transmitting the telegram from Graham to East Radford, both within the state, to send it to Bluefield, W. Va., and Washington, D. C., the law in this case was an interference with interstate commerce. The claim, the court said, was not filed in time and there was no certainty that the Federal question was involved.

TOLEDO, O.—Under a contract closed recently at Cleveland the United States Telephone Company leased its wires to the Independent Long Distance Telephone and Telegraph Syndicate for a period of ninety-nine years. The latter is composed of a number of prominent capitalists, many of whom are interested in the former concern. The new company has not yet been organized, but will be within a short time. Under this lease the long-distance line of the Independent is extended to the Atlantic, south to Louisville and west to Kansas City. New lines will be built, connecting with other lines, and messages will be carried by mileage. H.

NEW PROPOSALS.

UNDERGROUND CABLE FOR TORONTO, CANADA—The city of Toronto has issued specifications covering underground cable to the value of about $40,000. Tenders are to be in before the end of March. Address the Electrical Department, City Hall, Toronto, Canada.

POST OFFICE, SUMPTER, S. C.—The Treasury Department, office of the Supervising Architect, will receive sealed proposals at Washington, D. C., until 3 o'clock p. m., on the 19th day of April, 1909, for the construction complete of the United States Post Office at Sumter, South Carolina, in accordance with the drawings and specifications, copies of which may be had at that office or at the office of the Postmaster at Sumter, S. C., at the discretion of the supervising architect.

LAMP STANDARDS, U. S. POST OFFICE, SAN JOSE, CAL.—The Treasury Department, office of the Supervising Architect, Washington, D. C., will receive sealed proposals until 3 o'clock p. m. on the 15th day of April, 1909, for the lamp standards, etc. (complete in place), at the U. S. Post Office at San Jose, Cal., in accordance with drawings and specifications, copies of which may be had at that office or at the office of the custodian at San Jose, Cal., at the discretion of the supervising architect.

UNITED STATES POST OFFICES AT PITTSBURG, KAN., AND FAYETTEVILLE, N. C.—The office of the Supervising Architect, Washington, D. C., will receive sealed proposals until April 14, for the construction (including plumbing, gas piping, heating apparatus, electric conduits and wiring) of the United States Post Offices at Fayetteville, N. C., and Pittsburg, Kan., in accordance with specifications, which may be obtained from the custodians of the sites, or at the office of the Supervising Architect.

UNITED STATES ASSAY OFFICE BUILDING, NEW YORK, N. Y.—The office of the Supervising Architect, Washington, D. C., will receive sealed proposals until April 12, for the construction (including plumbing, water-supply system, etc.) of the superstructure to the extension, remodeling, etc., of the United States Assay Office Building, New York city, in accordance with specifications which may be had at the office of the Superintendent of Construction, United States Custom House, New York city, or at the office of the Supervising Architect.

DATES AHEAD.

Worcester Mechanical and Electric Exposition. Mechanics' Hall, Worcester, Mass., March 27-April 3.

Louisville Electrical Show. The Armory, Louisville, Ky., April 12-24.

Missouri Electric Light, Gas and Railway Association. Annual convention, Springfield, Mo., April 15-17.

Iowa Electrical Association. Annual convention, Cedar Rapids, Iowa, April.

American Electrochemical Society. Next meeting, Niagara Falls, Ontario, May 6-8.

Omaha Electrical Show. Omaha Auditorium, Omaha, Neb., May 6-15.

Southwestern Electrical and Gas Association. Annual convention, Dallas, Tex., May.

American Association of Electric Motor Manufacturers. Annual convention, Hot Springs, Va., May 18-20.

Ohio Society of Mechanical, Electrical and Steam Engineers. Annual convention, Canton, Ohio, May 21-22.

National Electric Light Association. Annual convention, Atlantic City, N. J., June 1-4.

Association of Edison Purchasing Agents. Annual convention, Atlantic City, N. J., June 1-4.

American Railway Master Mechanics' Association. Annual convention, Atlantic City, N. J., June.

Master Car Builders' Association. Annual convention, Atlantic City, N. J., June.

American Institute of Electrical Engineers. Annual convention, Thousand Islands, N. Y., June 28.

Ohio Electric Light Association. Annual convention, Toledo, July 13-15.

National Electrical Contractors' Association. Annual convention, Toledo, Ohio, July 21-23.

PERSONAL MENTION.

MR. R. A. DEMARS has been appointed chief engineer of the electric plant at Cloquet, Minn. C.

MR. W. W. DAVENPORT, for two years manager of the Iowa Telephone Company, at Clinton, Iowa, has been promoted to the position of traveling auditor. C.

MR. R. V. SUTLIFFE, formerly superintendent of the Dayton Electrical Manufacturing Company, is now in charge of the New York office of the Hoyt Electric Instrument Works, 1931 Broadway, New York city.

MR. HENRY C. MARTIN has resigned his position as assistant general passenger agent for the Twin City Rapid Transit Company, of Minneapolis, Minn., to accept one with the Oklahoma Electric Railways at Oklahoma City. C.

PROF. H. H. NORRIS has resigned the secretaryship of the Cornell Branch, A. I. E. E., and, while he will maintain an active part in the work, the office of secretary has been filled by the election of Mr. B. C. Dennison, instructor in the electrical engineering department of the university.

MR. HENRY M. STEELE, who has for the past few years been with J. G. White & Co., engineers and constructors, 43 Exchange Place, New York city, as chief civil engineer, has resigned on account of ill health, and has removed with his family from New York to Asheville, N. C.

MR. GEORGE F. FENNO, for the last two years insurance engineer with the Middle States Inspection Bureau, an organization maintained by thirty-six of the leading fire-insurance companies, has resigned in order to join the staff of the George H. Gibson Company, advertising engineers, Tribune Building, New York city. Mr. Fenno is a graduate of Sibley College, Cornell University, class of '06, and for some time after leaving school was telephone engineer for the New York & New Jersey Telephone Company. His experience with the Middle States Inspection Bureau has made him widely familiar with engineering and manufacturing plants, which will be valuable to him in his present work of promoting the sale of engineering supplies and equipment by means of publicity.

OBITUARY.

MR. HARMON H. WOODWORTH, advertising manager and assistant sales manager of the Automatic Electric Company of Chicago, Ill., died on Wednesday, February 24. It is with a genuine emotion of sorrow that we make this announcement. He was a fine young man and his death comes as a severe personal shock to a large circle of friends in both private and business life.

MAJOR EDMUND LOUIS ZALINSKI, retired army officer, inventor and engineer, best known for his invention of the pneumatic dynamite-throwing gun, died of pneumonia at the New York Hospital, New York city, March 10. Major Zalinski was born in Kurnich, Prussian Poland, on December 23, 1849. He came to America with his parents when he was four years of age. In the civil war he was appointed an aid on the staff of Gen. Nelson A. Miles. In 1865 he was commissioned a lieutenant of artillery, following an act of gallantry on the field of Hatcher's Run, Virginia. He was promoted to first lieutenant in 1867 and to a captaincy in 1887. Between 1882 and 1889 Major Zalinski became widely known as an inventor, and was actively engaged in experimental work in the perfecting of various military devices. At one time he was considered one of the greatest authorities on high explosives in the world. Some of his inventions were a ramrod bayonet, a telescopic sight for artillery, and an intrenching tool. He was best known for his development and perfection of the pneumatic dynamite torpedo gun. This weapon uses pneumatic power, and throws a projectile weighing 1,000 pounds, charged with 500 pounds of high explosive. The Vesuvius was armed with three of these guns. In 1904 he was retired from the army with the rank of major. He was a pioneer in the development of scientific data connected with the study of reflectors and reflecting surfaces as used in electric lighting. Recently he was elected president of the Bureau of Illuminating Engineering, New York, N. Y. Major Zalinski was a member of the American Association for the Advancement of Science, Illuminating Engineering Society and the American Institute of Electrical Engineers, and also of the Century, Union League, Engineers' and Lotos clubs.

NEW MANUFACTURING COMPANIES.

EAST ORANGE, N. J.—The Darby-Meeker Company has been formed with a capital of $125,000. The incorporators are John Darby, Clifford D. Meeker and Harold D. Meeker. The company is to manufacture electrical apparatus.

MANITOWOC, WIS.—The newly formed Aluminium Goods Manufacturing Company includes the Manitowoc Aluminium Novelty Company, the Two Rivers Aluminium Company and the New Jersey Aluminium Company of Newark, N. J. The company is incorporated under the laws of New Jersey with a capital stock of $750,000. G. A. Kruppschnitt of Newark, N. J., is president, and Joseph Koenig of Two Rivers and George Vits of Manitowoc are vice-presidents.

ELECTRICAL SECURITIES.

While trite, and apt to be considered as worn nearly threadbare, the only excuse for such a lame and halt market as was witnessed last week seems to be some considerable apprehension, or possibly misapprehension, over tariff changes. Marking time appears to be the order of the day, and of actual developments there seems to be nothing to chronicle. With the tariff reconstruction settled, however, it is apparent that much of the apathy now overwhelming so many affairs will be dispelled.

Dividends have been declared upon the following electrical securities: United Gas Improvement Company; regular quarterly dividend of two per cent, payable April 15 to stock of record March 31. Massachusetts Lighting Companies; regular quarterly dividend of one-and-one-half per cent, payable April 15 to stock of record April 1. West India Electric Company; a quarterly dividend of one-and-one-fourth per cent (the rate heretofore being one per cent quarterly). Regular quarterly dividend of one-and-three-fourths per cent on the stock of the Manhattan Railway Company, the elevated roads of the Interborough Rapid Transit system, which guarantees a seven-per-cent dividend as rental, payable April 1. Toronto Railway; a quarterly dividend of one-and-three-fourths per cent, payable April 1, against one-and-one-half per cent for the previous quarter. Western Union Telegraph Company; the regular quarterly dividend of three-fourths of one per cent, payable April 15 to stock of record March 20. United Traction and Electric Company; regular quarterly dividend of one-and-one-fourth per cent on the capital stock, payable to stock of record April 1. Quarterly guaranteed dividend of $1.75 per share on the West End Street Railway common stock, payable April 1. Union Traction Company of Indiana; regular semi-annual dividend of two-and-one-half per cent on the preferred stock, payable April 1 to stock of record March 28. American Telephone and Telegraph Company, the regular quarterly dividend of $2 per share, payable April 15 to stock of record March 31. Manila Electric Railroad and Light Company, regular quarterly dividend of one per cent on the capital stock, payable April 1 to stock of record March 23. Cincinnati Gas and Electric Company; a regular quarterly dividend of one-and-one-eighth per cent, payable April 1. Duluth Edison Electric Company; the regular quarterly dividend of one-and-one-half per cent, payable April 1 to stockholders of record March 17.

ELECTRICAL SECURITIES FOR THE WEEK ENDED MARCH 13.

New York:	*Closing.*
Allis-Chalmers common	13
Allis-Chalmers preferred	41
American Tel. and Tel. Company	129⅛
Brooklyn Rapid Transit	70½
General Electric	151½
Interborough-Metropolitan common	14⅞
Interborough-Metropolitan preferred	43½
Kings County Electric	125
Mackay Companies (Postal Telegraph and Cable) common	71
Mackay Companies (Postal Telegraph and Cable) preferred	70½
Manhattan Elevated	140
Metropolitan Street Railway	25
New York and New Jersey Telephone	110
Western Union	65¾
Westinghouse Manufacturing Company	77

The annual meeting of the American Telegraph and Telephone Company will be held March 30 at noon. Books will be closed from March 19 to March 30, inclusive.

Recent reports of greatly increased earnings on the lines of the Brooklyn Rapid Transit system have been exagerated, President Winter says, although traffic has been considerably ahead of that for corresponding weeks of last year since the recovery began three months ago. Receipts have run ahead of those for corresponding days a year ago on an average of from $2,000 to $5,000 a day.

Boston:	*Closing.*
Edison Electric Illuminating	254
Massachusetts Electric	70½
New England Telephone	130½
Western Telephone and Telegraph pref.	78
Philadelphia:	*Closing.*
Electric Company of America	11¾
Electric Storage Battery common	46
Electric Storage Battery preferred	46
Philadelphia Electric	11¾
Philadelphia Rapid Transit	27⅞
United Gas Improvement	90¼
Chicago:	*Closing.*
Chicago Telephone	133
Commonwealth Edison	111¼
Metropolitan Elevated preferred	52¼
National Carbon common	82
National Carbon preferred	119

INDUSTRIAL ITEMS.

DEAN BROTHERS STEAM PUMP WORKS, Indianapolis, Ind., has prepared a new catalogue illustrating, describing and listing its independent air pumps, jet and surface condenser pumps, vacuum pumps, air and circulating pumps and condensing apparatus.

THE WESTERN ELECTRIC COMPANY, New York and Chicago, has issued a unique booklet entitled "Satisfaction." This shows a number of photographs of President Taft using a Western Electric telephone. The facial expressions substantiate the title of the booklet. There are also a number of excerpts from the writings of Mr. Taft.

THE CROCKER-WHEELER COMPANY, AMPERE, N. J., in its bulletin No. 110, supplies a list of those using its engine-type direct-current generators. This list covers fifteen solid pages of the names and addresses of industrial plants, street railways, railroad and other machine shops, office buildings, stores, schools and residences. Several United States battleships are equipped with Crocker-Wheeler generators.

THE KIMBLE ELECTRIC COMPANY, 324 Washington Boulevard, Chicago, Ill., has recently moved to more commodious quarters at the above address, finding that the large sale achieved by its product of variable-speed alternating-current motors had made its former factory at 619 West Adams Street insufficient for the manufacturing space required. The Kimble company has correspondingly enlarged its force of workmen.

THE MASSACHUSETTS CHEMICAL COMPANY, Walpole, Mass., is making further additions to its plant. The present addition is to accommodate the increase in the business of the molded rubber department. The use of molded rubber goods, particularly in the electrical line, has assumed large proportions. Bushings, pump valves, rubber mats, car steps, etc., are also some of the specialties of this department of the Massachusetts Chemical Company.

THE GENERAL COMPRESSED-AIR AND VACUUM MACHINERY COMPANY, St. Louis, Mo., is sending out its booklet No. 90 on the Thurman portable electric vacuum cleaner. This machine is operated from any electric-light socket; is practically fool-proof and does not require mechanical ability to operate. A complete set of devices goes with each outfit to clean carpets, rugs, upholstery, tuft buttons, draperies, tapestries, walls, bare and tile floors, clothing, mattresses, etc., besides face and body massage tools.

DOSSERT & COMPANY, 242 West Forty-first Street, New York city, report having received the following large orders during the current week: From the Compagnie Egyptienne Thomson-Houston, Cairo, Egypt, 500 cable taps and 500 back connection lugs; from the Western Electric Company, for shipment to Johannesburg, South Africa, 300 front connection lugs, 200 two-ways, 100 three-ways and 100 cable taps; from the United Electric Light and Power Company, 2,000 flat-shank terminal lugs for service cut-outs.

THE J. LANG ELECTRIC COMPANY, 117-128 North Lincoln Street, Chicago, has designed a Universal service cabinet which combines a main switch, main fuse, meter loop and panel board in one. This does away with the necessity of two separate cabinets, reduces the number of connections, and simplifies the installation. The cabinet is particularly for use on small installations, such as residences, apartment buildings, small stores, etc., and can be used on a two-wire, 110-volt system, or a three-wire, 250-125-volt system. The change can be made in a moment's time. A new circular being mailed by the Lang Electric Company describes, specifies and lists these panels.

THE AMERICAN ENGINE COMPANY, Bound Brook, N. J., directs attention to the space-saving qualities of the angle-compound engine it has recently introduced. One of these engines, of a capacity of 500 horsepower, was recently selected to drive a centrifugal circulating pump in connection with the condenser outfit of the Interborough Rapid Transit Company at the Fifty-ninth Street and North River power house, New York City. The American Engine Company also reports a sale of an angle-compound engine to the United States Government for the Coast Artillery School at Fort Monroe, to be installed along with two American Ball duplex compound engines.

THE NATIONAL ELECTRIC LAMP ASSOCIATION'S ENGINEERING DEPARTMENT, Cleveland, Ohio, has just published Bulletin No. 6D on the subject of tungsten multiple lamps for 100 to 125 volts, describing the twenty-five and forty-watt units having standard short Edison bases with small bulbs, and forty, sixty and 100-watt units with skirted Edison bases and large bulbs. This bulletin is a very valuable compendium of information and engineering data relating to the commercial sizes of tungsten incandescent lamps. Curves shown indicate the candlepower, current and efficiency of the lamps during their life, and tables give the per cent variation of the candlepower of these units for various percentages of regulation of the voltage. An amount of useful information is given for the operation of tungsten lamps and the selection of reflectors. A very carefully computed table shows the comparative costs of the different filamented lamps for the usual commercial power charges. The final pages of the bulletin, given over to illumination data, illustrate the new high efficiency styles of extensive, intensive and focusing Holophane reflectors, giving characteristic light-distribution curves and illumination tables from which the intensity of illumination from the standard sizes of lamps can be computed at vertical and horizontal distances.

DIE MASCHINENFABRIK OERLIKON, of Oerlikon, near Zurich, Switzerland, has published recently a number of bulletins relating to its new or improved manufactures. One of these describes its oil-insulated and air-cooled transformers, another enclosed switch cabinets for large polyphase-induction motors, and a third is devoted to a new type of portable riveting machine, termed by the makers "electro-hydraulic;" the latter is really a compact motor-driven hydraulic riveter. An interesting publication by this firm is a forty-page pamphlet giving the results of an investigation made by Dr. H. Behn-Eschenburg on the effects of the single-phase motors of the Seebach-Wettingen line on telephonic transmission.

THE AVERY SCALE COMPANY, North Milwaukee, Wis., maker of the Avery patent automatic scale for weighing coal delivered at power houses, has recently placed on the market its track scale and truck weigher, which automatically indicates the net weight of every car or truck load of coal, adds up and registers the total net weight of all loads, and counts the number of loads passing over the machine. With this machine, skilled labor is entirely unnecessary, the movement of a single hand lever or wheel performing all the above operations. A reliable record can be automatically obtained of the day's weighing or of weighings for any given period. These scales have been installed in a number of power stations.

THE HOSKINS MANUFACTURING COMPANY, formerly The Hoskins Company of Chicago, has opened its new plant and general offices at 453 to 471 Lawton Avenue, Detroit, Mich., where it has an extensive factory, new equipment, and enlarged facilities for making and distributing its established line of electric furnaces, pyrometers and heating appliances. With the reorganization and increase of capital to $500,000, the management remains the same as before. The officers of the company are: Hoyt Post, president; W. W. Talman, vice-president and sales manager; E. F. Hoskins, general manager and treasurer, and Jonathan Palmer, Jr., secretary. A. L. Marsh will continue in the capacity of electrical engineer for the company.

THE FORT WAYNE ELECTRIC WORKS, Fort Wayne, Ind., has published an index to its bulletins Nos. 1001 to 1113, which is arranged both numerically and by subject. Among the bulletins just completed are No. 1113, devoted to three-bearing belted direct-current generators with balance wheels particularly adapted for use with internal combustion engines, and No. 1114 which describes fan motors for every kind of service; the latter publication comprises twenty-four pages replete with over thirty excellent engravings of the various types of electric fans made by this company. A circular has also been prepared that describes electrically-driven, double-acting, high-speed piston pumps in sizes having capacities from 125 to 1,000 gallons per hour.

THE HARVARD ELECTRIC COMPANY, 66 West Van Buren Street, Chicago, announces the receipt of a letter from its sales manager, Allen L. Haase, which says: "Throughout my present trip, covering part of the great Northwest and particularly Iowa, Nebraska, etc., all through this territory there is a buoyant feeling among the business men that seems to assure a good volume of business from that entire section this year, and I was especially pleased with the condition existing all through this great agricultural belt. Of course, the entire territory that I am covering on this trip is tributary to Chicago, and it is a pleasure to realize the warm and cordial attitude that the business men throughout this territory present to Chicago manufacturers and jobbers."

THE DuBOIS IRON WORKS, DuBois, Pa., manufacturers of "DuBois" gas engines and steam and power pumps, has been awarded the contract for the complete equipment and installation of the pumping station for the Clarion Water Works, Clarion, Pa. The machinery purchased consists of one 150-horsepower "DuBois" tandem natural gas engine, geared to a million-gallon pump. Also one fifty-horsepower unit for driving air compressor, one centrifugal pump, together with all the necessary fittings, etc. The plant is installed as an auxiliary to the present steam pumping equipment, which will eventually be replaced by a duplicate of the new gas-engine-driven unit. The engines and pumps will work against a head of 685 feet, pumping through 4,000 feet of ten-inch main to the standpipe. A complete new power station is being erected and the plant when finished will be one of the most efficient and modern of the kind in the country. The DuBois Iron Works has also been awarded a contract for a 160-horsepower twin-tandem gas engine, direct-connected to a 100-kilowatt generator for the lighting plant of the Seventy-fourth Regiment State Armory Building at Buffalo, N. Y.

RECORD OF ELECTRICAL PATENTS.

Issued (United States Patent Office) March 9 1909.

914,375. ELECTROMAGNETIC CLUTCH. Heinrich Ast, Vienna, Austria-Hungary, assignor to the firm of Vulcan Maschinenfabriks-Actien-Gesellschaft, Vienna, Austria-Hungary. Filed June 15, 1906. Is provided with means on the running bush to deflect the lubricant in a direction to avoid the parts likely to be injuriously affected thereby.

914,386. BLOCK-SIGNALING SYSTEM. Harry M. Coulter, Chicago, Ill., assignor of one-half to Alfred Stromberg, Chicago, Ill. Filed August 2, 1907. A track circuit includes a controlling relay associated with each block, track contacts located in each block and a signaling circuit extending from each relay to the track contacts of the second block in each direction.

914,395. TELEPHONE DISINFECTOR. Mary A. Dohney, Chicago, Ill. Filed August 21, 1908. A circular receptacle containing a germicide capsule is attached to the transmitter mouthpiece.

914,398. DEVICE FOR VENDING ELECTRICITY. Evan Evans, Berlin, Germany, assignor to Bergmann Elektricitäts-Werke-Aktiengesellschaft, Berlin, Germany. Filed January 6, 1908. In a prepayment meter the coin closes a gap in the circuit.

914,412. RAILROAD SIGNAL. Henry H. Hoeschen, Omaha, Neb. Filed May 27, 1907. Combined with a signal are induction coils whose armature is operated through a pair of train-actuated levers.

914,413. ELECTRIC FAN. Alfred T. Hoevet, New York, N. Y. Filed January 11, 1908. Depending from the casing of the fan motor is a member containing a switch and fitting into a socket in the base.

914,435. ROTARY CIRCUIT CLOSER. Frank E. Lind, Kent, Ohio. Filed July 9, 1908. A radial contact arm is carried by a shaft and is adapted to pass between and make electrical contact with sets of two balls, each arranged in an annular insulating head.

914,445. ENGINEER'S ALARM. Edward McClintock, St. Paul, Minn., assignor to McClintock Manufacturing Company, St. Paul, Minn. Filed December 18, 1905. Normally closed caution and danger signal circuits are carried by the locomotives and there are means whereby these circuits on a second train will be successively broken to operate their signals when the track circuit of a block is interrupted by the passage of a train ahead.

914,447. ELECTRIC SWITCH-LOCK. Walter P. Neubert, Swissvale Borough, Pa., assignor to the Union Switch and Signal Company, Swissvale, Pa. Filed September 10, 1908. Combined with a railroad switch is a lock with a pivoted dog for controlling the locking mechanism and electrical devices for releasing the dog.

914,461. ELECTRIC BLOCK SYSTEM FOR RAILWAYS. Charles H. Shaffer, Muskegon, Mich. Filed April 1, 1907. A trolley wire is divided into blocks with a station at their junction, signaling instruments in the station connected one to the trolley section of each block, and a telephone that can be connected with either section.

914,468. LOCKOUT FOR PARTY-LINE TELEPHONES. William F. Wagner, Detroit, Mich., and William E. Shiels, Toledo, Ohio, assignors to the Gravity Lockout Company, Toledo, Ohio. Filed February 26, 1908. Mechanical and magnetic means are adapted to close the ground circuit and open the primary circuit when another telephone in the line is in use.

914,482. RAILROAD AUTOMATIC DANGER AND SAFETY SIGNAL SYSTEM. Albert F. Eells, Boston, Mass., assignor of one-eighth to William J. Barnette, U. S. Navy, Washington, D. C. Filed August 15, 1908. Each car carries a signal-controlling device in a normally closed circuit. The entry of another car in the block weakens the current in the circuit without interrupting it and thus causes the controlling device to act.

914,483. DEVICE FOR PREVENTING COLLISIONS AT SEA. Georg Erdmann, Berlin, and Clara Fischer, Charlottenburg, Germany, guardian of Gotthold Fischer, an insane person. Filed October 21, 1907. The apparatus comprises a self-acting transmitter of electric waves, a receiver for such waves located on another ship and mechanism actuated by current in the receiver circuit for stopping the engines of the ship.

914,489. ELECTRIC FURNACE. Samuel F. Hall, Niagara Falls, N. Y., assignor to Norton Company, Worcester, Mass. Filed June 1, 1908. Is provided with a furnace chamber having exterior and interior walls exposed on one side to the charge and on the other side to the air.

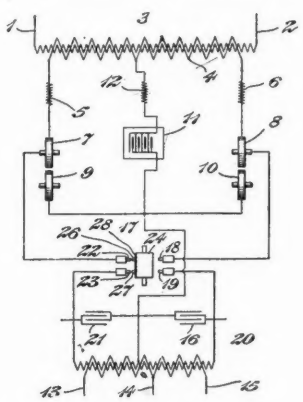
914,499. ELECTRICITY RECTIFIER. Thomas J. Murphy, Rochester, N. Y. Filed March 19, 1908. A synchronous motor drives a commutator that enables two condensers to discharge over air gaps and thus form alternate paths for half the main alternating-current wave.

914,515. SWITCH. Carl D. Rolfe and Carl F. Fox, Rochester, N. Y., assignors to Charles A. Rolfe, Redlands, Cal. Filed January 7, 1907. Two spring-actuated and normally-open contact members are adapted to close a first circuit, a swing arm being adapted to close a second circuit and if moved still farther to close the first circuit.

914,532. ELECTRIC IGNITION APPARATUS FOR INTERNAL-COMBUSTION ENGINES. Chester H. Thordarson, Chicago, Ill. Filed February 15, 1907. Combined with a number of sparking terminals is an inductor alternator with primary and secondary coils placed on radial cores, the secondaries being connected to the sparking terminals.

914,535. OPERATING MECHANISM FOR CIRCUIT CONTROLLERS. Norval W. Truxal, Boston, Mass. Filed June 13, 1907. The flow of fluid between two receptacles governs the operation of the switch.

914,537. AUTOMATIC ELECTRIC IGNITER SWITCH. Cromy L. Vannort, Louisville, Ky. Filed December 21, 1905. Comprises an electrically-operated switch that holds a battery circuit normally closed and a dynamo circuit normally open, a shunt around the dynamo containing a signal lamp to indicate when the dynamo is operating.



914,499.—MURPHY ELECTRICITY RECTIFIER.

914,540. SPARK PLUG. Frank J. Watt, Detroit, Mich. Filed September 9, 1908. Consists of a tubular metal nipple, an insulating bushing screw-threaded into it and having a counterbored lower end with a metal bushing seated in the counterbore.

914,569. AUTOMATIC ALARM FOR SPRINKLER SYSTEMS. George O. Haskell, New York, N. Y. Filed April 1, 1908. A hydrostatic differential in communication with a bypass contains an electric conductor adapted to close a circuit by its movement and thus sound an alarm on the releasing of a sprinkler head.

914,611. RAILWAY SIGNALING MEANS. Thomas W. Stanage, Porterville, Cal., assignor of one-half to Aubrey M. Lumley, Porterville, Cal. Filed July 13, 1908. A system for indicating to the engineer of a train within any block the entrance of an oncoming train therein has provided a current rail, and a switch connecting adjacent sections thereof on the passage of a train and thus operating a signal in the locomotive cab.

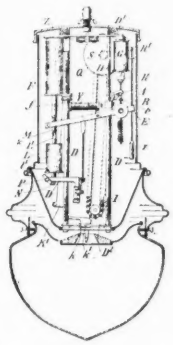
914,626. CONTACT-MAKER FOR HELM INDICATORS. Frank W. Wood, Newport News, Va., assignor to Charles Cory and John M. Cory, New York, N. Y. Filed December 19, 1907. Comprises a contact drum, a contact arm mounted on a shaft, a second shaft, gears carried by the two shafts, a crossbar also carried by the second shaft, an oscillatory post and a connection between the post and the crossbar.

914,646. STORAGE BATTERY. Edward C. Ekströmer, Boston, Mass., assignor to Joseph C. Kent, trustee. Filed June 3, 1907. The cover plate for the cell is of non-flexible material adapted to closely fit the battery casing and provided with depending members arranged transversely to the element and having their lower edges in contact with all the plates and separators when in position.

914,657. ELECTRIC ACCUMULATOR PLATE. Charles F. Guyon and Robert W. Vicarey, New York, N. Y., assignors to Industrial Storage Battery Company. Filed October 30, 1908. Consists of a conducting rib and a number of V-shaped strips of thin metal alternately corrugated and non-corrugated laterally projecting from the rib.

914,677. SHUNT-CONTACT FOR ELECTRIC SWITCHES. William M. Scott, Philadelphia, Pa. Filed March 26, 1907. The carbon tips of a circuit-breaker are made of a mixture of carbon with finely-divided material of higher conductivity.

914,684. ARC LAMP. William F. Warner, Muncie, Ind., assignor to Warner Arc Lamp Company, Muncie, Ind. Filed June 25, 1906. Consists of a solenoid in each branch of the circuit, a walking beam at the ends of which the solenoid cores are secured, a switch to throw the current from one solenoid to the other, a thermostat actuated by a current to move the switch, and connections between the walking beam and



914,869.—FLAMING-ARC LAMP WITH MAGAZINES.

clutch, so that with each movement of the former the clutch will release and then pick up the movable electrode.

914,690. TELEPHONE SYSTEM. Frank W. Wood, Newport News, Va., assignor to Charles Cory and John M. Cory, New York, N. Y. Filed July 6, 1906. Contains a clearing-out drop and a non-inductive resistance connected in shunt therewith.

914,713. MULTIPLEX TELEGRAPH SYSTEM. Tullio Giara, Boston, Mass. Filed July 28, 1905. Has a keyboard for sending alternating-current impulses over the main line, a local circuit controlling the printing mechanism, and a means for closing this circuit comprising an electromagnet in the main line and a vibrator attuned to respond to alternating current of a definite frequency.

914,715. REGISTERING MECHANISM FOR TELEPHONES. Vincent D. Greene and Karl W. Fort, Chicago, Ill. Filed September 9, 1907. Combined with the call-effecting device of an automatic telephone is a register for outgoing calls consisting of a circuit controller and means whereby the registering mechanism is operated and the controller returned to normal position.

914,719. TROLLEY BASE. John A. Hanson, Detroit, Mich. Filed March 9, 1908. A spring-actuated auxiliary arm is slidably connected to the trolley pole so as to exert an upward pull upon it.

914,721. SYSTEM FOR PROTECTION AGAINST FIRE. Henry B. Helm, New York, N. Y. Filed August 11, 1908. A group of endless wires containing fusible links and tensioning means is connected with an electric alarm and indicating apparatus.

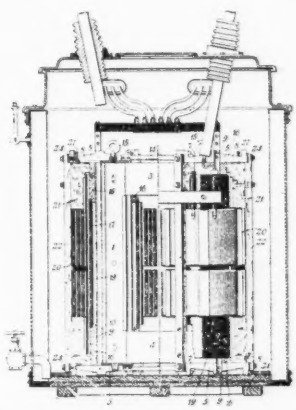
914,756. ELECTRICALLY-OPERATED BRAKE. Charles Saunders, Philadelphia, Pa., assignor to Lidgerwood Manufacturing Company. Filed March 27, 1906. Combined with a wheel and a bandbrake therefor is a solenoid suspended from the brake band and adapted to release the brake.

914,762. CONDUIT RECEPTACLE. James S. Stewart, New York, N. Y., assignor to Annie Stewart, New York, N. Y. Filed March 7, 1908. Combined with an outlet box having a perforated cover plate is a porcelain receptacle received through the plate and freely removable means adapted to be fastened on the outside of the plate for anchoring the receptacle in place.

914,768. ELECTRIC-LIGHT CORD OR CABLE ADJUSTER. Frank E. Walker and Arthur C. Walker, River Point, R. I. Filed April 1, 1907. A double concave block is mounted on a base and a clamping member is pivotally mounted upon it, so that the grooves in the block and clamping members constitute a curved duct for the cord which the latter member is adapted to clamp.

914,772. PORTABLE ELECTRIC-LIGHT FIXTURE. Leroy A. Williamson, Providence, R. I. Filed May 29, 1908. A lamp socket is mounted in a casing which also contains lamp cord wound around the socket to which one end is fastened, the free end passing through a hole in the casing and being connected to an attachment plug.

914,801. AUTOMATIC ELECTRICAL SIGNALING SYSTEM FOR RAILWAYS. Charles Crandall, Newport, R. I., assignor of one-half to Henry F. Curran, Springfield, Mass. Filed October 12, 1907. Renewed September 2, 1908. Comprises a relay, an alternating current connected therewith, devices for converting this into a direct-pulsating current of high tension and for charging aerial conductors therewith, a locomotive equipped with a receiving apparatus made operative by electrical impulses from the aerial conductors when the engine enters the latter's zone.



914,941.—TRANSFORMER STRUCTURE.

914,808. RAIL BOND. Fred H. Daniels, Worcester, Mass. Filed October 16, 1906. Consists of two telescopic members engaging the rail from opposite sides and having each a flanged head whose inner face is soldered to the rail.

914,837. LINE SUPPORT. John D. Hilliard, Albany, N. Y. Filed November 1, 1906. A tie wire on an insulator has a clamp securing its free ends and the conductor in parallel relation in the same plane.

914,840. BINNACLE LIGHT. Benjamin V. How, Weston, Mass., assignor to Mary Isabelle How, Weston, Mass. Filed December 21, 1907. A mariner's compass has a binnacle with an oscillatory upright shaft supported by it and an arm projecting from the shaft carrying at its tip an incandescent lamp adapted to illuminate any desired part of the dial.

914,856. ELECTROLYTIC APPARATUS. Otto Meyer, Richmond, Va. Filed February 10, 1908. The cell is composed of three concentric pipes, the inner and outermost being electrodes.

914,868 and 914,869. ELECTRIC ARC LAMP. Charles Oliver, Woolwich, England. Filed July 7, 1905, and July 1, 1907. A flaming-arc lamp is provided with two carbon-holding magazines and means to move one of them toward the other.

914,875. ELECTRICAL INSECT DESTROYER. Peter J. Peterson, Oakland, Cal. Filed June 15, 1908. A glass plate is mounted parallel to the window pane and on each side of the narrow space thus formed is stretched a set of oppositely charged electric wires.

914,877. TELEGRAPH REPEATER. George L. Rawdon, Cleveland, O. Filed April 30, 1908. A pair of main receiving relays, each having a main and a differential magnet, has means whereby the armature of one relay controls directly one coil of the differential magnet of the opposite relay.

914,878. ELECTRIC SWITCH. Stacey G. Read, Springfield, Mass. Filed January 20, 1908. A block provided with a fulcrum pocket has a removable oscillatory switch arm adapted to utilize the walls of the pocket as an external fulcrum.

914,888. ELECTRICALLY-HEATED CURLING-IRON. Brigham Y. Snyder, Salt Lake City, Utah, assignor to Electric Utility Company, Salt Lake City, Utah. Filed January 29, 1908. Renewed January 11, 1909. One prong contains an electrical heating means.

914,891. ELECTRODE FOR ARC LIGHTS. Charles P. Steinmetz, Schenectady, N. Y., assignor to General Electric Company. Filed February 26, 1902. Renewed February 26, 1904. An arc-lamp electrode in which magnetite predominates.

914,892. ELECTRIC CURRENT AND VOLTAGE REGULATOR. Simon B. Storer, Syracuse, N. Y. Filed February 6, 1906. Comprises two electrical elements opposing each other so as to produce a balance, a solenoid having a movable plunger and retracting means therefor for automatically maintaining a predetermined current in one of the elements.

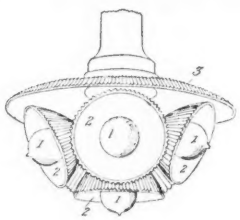
914,939. ELECTRIC ARC LAMP. Richard Fleming and Cromwell A. B. Halvorson, Jr., Lynn, Mass., assignors to General Electric Company. Filed December 26, 1903. In a luminous arc lamp the non-consuming electrode comprises an annular member from which the arc extends in normal operation and means for removing material deposited on the peripheral surface of this member from the arc.

914,941. TRANSFORMER STRUCTURE. Charles Le G. Fortescue, Wilkinsburg, Pa., assignor to Westinghouse Electric and Manufacturing Company. Filed June 8, 1907. The laminated core consists of a number of parallel cruciform legs and cross members joining the same at their ends, brackets at the ends of the core legs, and means located in the reëntrant angles thereof for connecting the brackets at opposite ends.

914,946. METHOD OF WELDING. Frederick G. Haldy, Stamford, Conn., assignor to The Yale and Towne Manufacturing Company, Stamford, Conn. Filed July 25, 1908. Method of making a chain link consists in heating the abutting ends of the blank by means of an electric current and forcing them together.

914,948. ROTARY PLANING MACHINE. Ellis J. Hannum, Philadelphia, Pa., assignor to Newton Machine Tool Works, Philadelphia, Pa. Filed March 27, 1907. A motor is mounted on the frame and drives the cutter head through gearing.

914,959. CURRENT INDICATING APPARATUS. John S. J. Lallie, Denver, Colo. Filed March 24, 1906. Propellers placed on the bottom of the stream of water are connected



915,056.—HOLOPHANE ARC.

with an electric circuit containing a telephone receiver and battery so that electric impulses corresponding to the speed of rotation are transmitted to the receiver.

914,964. IGNITER. Joseph H. Mantion, John B. Mantion, and Arthur W. Stanley, Hull, Quebec, Canada. Filed March 18, 1908. A torch stick of conducting material is adapted to be drawn across two adjacent but separated electrodes of opposite polarity so as to produce ignition sparks.

914,972. CONTROLLER FOR ELECTRIC MOTORS. Thomas S. Perkins, Wilkinsburg, Pa., assignor to Westinghouse Electric and Manufacturing Company. Filed March 7, 1904. The controller contains retarding means for the device short-circuiting resistance in series with the armature.

914,975. PORTABLE ELECTRIC LIGHT. Guy R. Radley, Milwaukee, Wis. Filed July 27, 1905. Parallel with a metal shell provided with a socket and reflector is an annular metallic holder with a spring circuit-closing contact at its base.

914,981. TRANSFORMER. Harold B. Smith, Worcester, Mass., assignor to Westinghouse Electric and Manufacturing Company. Filed September 4, 1906. A high-tension transformer winding comprises concentric cylindrical coils formed of strap conductors and spacing tubes and barrier plates of insulating material serving to separate the coils.

914,995. ELECTRIC CIGAR LIGHTER. John W. Todd, Jr., Jackson, Miss., assignor to O. S. Johnson and C. M. Cain, Jackson, Miss. Filed January 8, 1908. Two metallic contact strips, each providing a tortuous passage for an electric current, are arranged in a slot in the top of a casing.

915,016. ELECTRIC CONTROLLER. Frank E. Case, Canton, O., assignor to The Harvard Company, Canton, O. Filed June 29, 1908. Comprises a lever and a disc coaxially pivoted, a rheostat on the disc, and fixed jaws and disc jaws co-operating with a switch blade for changing the connections.

915,044. PHOTOGRAPHIC-PRINTING APPARATUS. Thomas T. Sabroe, Copenhagen, Denmark. Filed April 16, 1907. Inside a copying cylinder is a mercury-vapor lamp.

915,048. MOLDED RECEPTACLE. Harold B. Smith, Worcester, Mass., assignor to Westinghouse Electric and Manufacturing Company. Original application filed September 4, 1906. Divided and this application filed January 5, 1907. A concrete tank for a high-tension transformer has a sectional sheet-metal lining provided with lateral projections imbedded in the concrete and cemented together.

915,052. ARC LAMP. Willis R. Whitney, Boston, Mass., assignor to General Electric Company. Filed November 16, 1903. A luminous arc lamp has a non-consuming positive electrode and a negative electrode containing magnetic oxide of iron.

915,053. REVERSING SWITCH. James Dalziel, Derby, England. Filed April 6, 1907. The movable arm is connected to the controlling moving part by means of reversely set pawls and a ratchet with reversely set teeth.

915,056. ILLUMINATOR. Van Rensselaer Lansingh, New York, N. Y., assignor to Holophane Glass Company, New York, N. Y. Filed October 20, 1906. A form of Holophane "arc" comprises a cluster of incandescent lamps with an independent prismatic reflector for each lamp and a master reflector common to and enclosing all the lamps and intended to reflect the combined light in a downward direction.

PATENTS THAT HAVE EXPIRED.

Following is a list of electrical patents (issued by the United States Patent Office) that expired March 16, 1909:

470,666. POLICE AND FIRE-ALARM SIGNALING APPARATUS. L. B. Firman, Chicago, Ill.

470,667. COMBINED POLICE AND FIRE-ALARM SIGNAL APPARATUS. L. B. Firman, Chicago, Ill.

470,697. PROTECTOR FOR ELECTRICAL APPARATUS. C. H. Morse, Cambridge, Mass.

470,701. SECONDARY BATTERY. G. E. Parker and C. E. Crapo, Rochester, N. Y.

470,721. LIGHTNING ARRESTER. E. Thomson, Lynn, Mass.

470,722. TELL-TALE DEVICE FOR ELECTRIC CIRCUITS. E. Tregoning, Malden, Mass.

470,748. ELECTRIC SWITCH. S. Deacon, Lynn, Mass.

470,749. FIELD MAGNET FOR DYNAMOS. G. E. Dorman, Chicago, Ill.

470,768. PRINTING TELEGRAPH. E. J. Silkman, Baltimore, Md.

470,772 and 470,773. CIRCUIT-INTERRUPTING DEVICE. A. Wurts, Pittsburg, Pa.

470,774. APPARATUS FOR PROTECTING CIRCUITS. A. Wurts, Pittsburg, Pa.

470,784 and 470,785. DYNAMO. W. H. Elkins, Cambridge, Mass.

470,786. APPOINTMENT SIGNAL FOR TELEPHONES. S. W. Gray, Fort Dodge, Iowa.

470,792. GALVANIC BATTERY. F. H. Root, Chicago, Ill.

470,793. SWITCH FOR ELECTRIC SIGNALING APPARATUS. L. Sellner, Vienna, Austria-Hungary.

470,813. ELECTRIC RAILWAY SIGNAL. A. J. Wilson, Port Chester, N. Y.

470,817. ELECTRIC RAILWAY MOTOR. F. O. Blackwell, New York, N. Y.

470,831. ANNUNCIATOR. A. H. Brintnell, Toronto, Canada.

470,865. TRANSMISSION OF ELECTRICAL ENERGY TO A DISTANCE. M. Deprez and J. Carpenter, Paris, France.

470,924. ELECTRIC CONDUCTOR. T. A. Edison, Llewellyn Park, N. J.

470,926. DYNAMO-ELECTRIC MACHINE OR MOTOR. T. A. Edison, Llewellyn Park, N. J.

470,928. ALTERNATING-CURRENT GENERATOR. T. A. Edison, Llewellyn Park, N. J.

470,930. DYNAMO-ELECTRIC MACHINE. T. A. Edison, Llewellyn Park, N. J.

471,063 and 471,064. ELECTRIC ELEVATORS. R. C. Smith, Yonkers, N. Y.